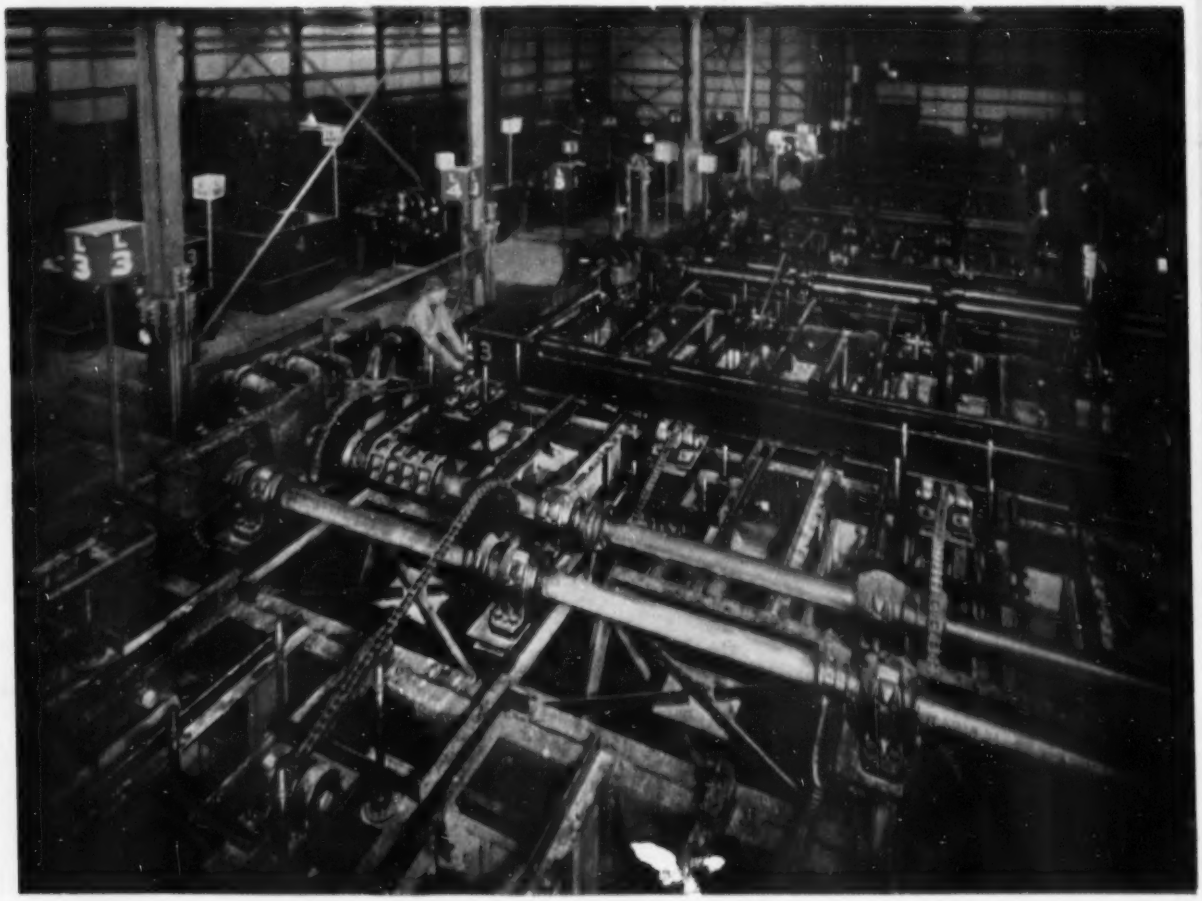
OCTOBER 1956 Vol. 18 No. 11

MINING WORLD



How Anaconda Mills U_3O_8 Ore at Bluewater

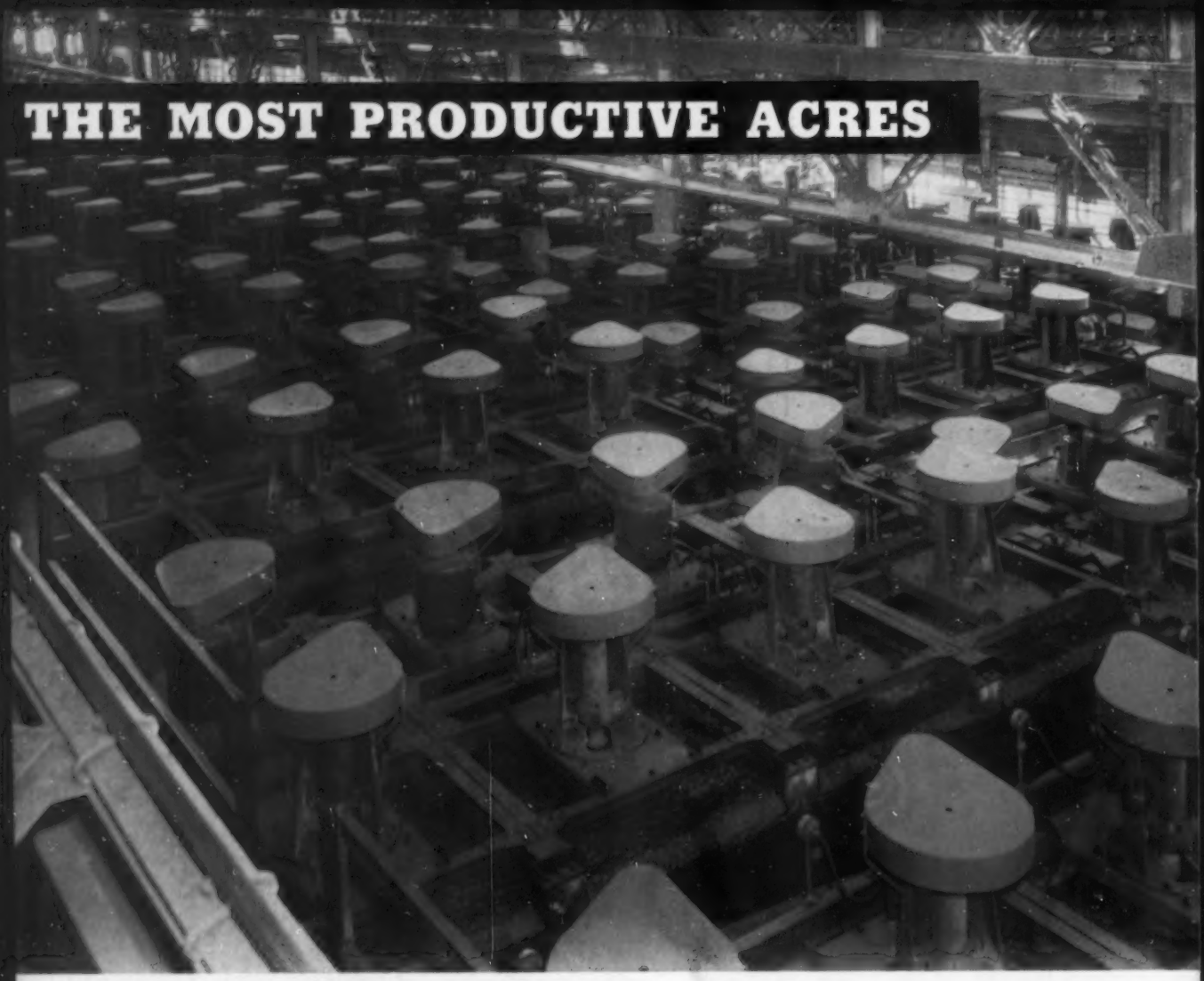
Page 46

Reserve Taconite—The First Full Report

Page 52

50 cents a copy—3s 6d in sterling

THE MOST PRODUCTIVE ACRES



For roughing, scavenging and cleaning

Wemco Fagergren Flotation Machines

deliver the most per foot

and per dollar.

Where flotation machines are used by the acre, the Wemco Fagergren is by far the most frequent choice. The reasons are equally important to the user of many cells or few. Because the large operators can afford and do run the most exhaustive competitive tests, they are able to determine which flotation machines provide the most profits at least cost.

Their choice of Wemco Fagergrens is based on these well proven advantages:

1. Greatest capacity per dollar investment
2. Highest recovery of values
3. Smallest floorspace requirements
4. Minimum reagent cost
5. Lowest supervision requirement

Wemco's field engineers can show you the proof.

Write today for further information

WEMCO
WESTERN MACHINERY COMPANY

760-B Folsom Street · San Francisco 7, California

Representatives throughout the United States and Canada and in major countries around the world.

New CAT* No. 9 Ripper FOR THE Mighty D9!

First choice for push-loading, the D9 is now more versatile than ever. The new No. 9 Ripper lets the D9 rip tough or frozen material between loading cycles. Faster, easier scraper-loading cuts time and costs.

TRACTOR-MOUNTED

The tractor-mounted No. 9 Ripper utilizes the weight of the D9 to force the teeth into hard material. No need for ballast or extra weights. The hydraulically operated ripper affords maximum maneuverability because it is tractor-mounted.

"LIVE DRIVE" HYDRAULIC PUMP

New No. 50 Hydraulic Control has a constant power pump that supplies the capacity to raise or lower ripper teeth *independently* of flywheel clutch or torque converter.

TWO RIPPING POSITIONS

Shanks may be pinned in either of two ripper positions which provide either maximum ground clearance when raised or maximum penetration (up to 28") when lowered.

TRIPLE TEETH

Use one, two or three. Any or all of them can be swung up and pinned out of the way. Teeth pivot 10° to either side. This permits tractor steering and smoother ripping through rocks. Shanks are heat-treated alloy steel, with hardened alloy cast steel boots. Points are hardened cast steel, *pin-attached* for easy replacement.

MANY OTHER IMPORTANT FEATURES!

Now the new No. 9 Ripper makes the "King of the Crawlers" an even more profitable and versatile machine. Mail the coupon for full details, or call your nearby Caterpillar Dealer. And remember, you can count on him for reliable service, and for parts you can trust.

Caterpillar Tractor Co., San Francisco, Calif.; Peoria, Ill., U.S.A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

MODERN HEAVY-DUTY TRACTOR RIPPERS

MAIL TODAY!

Caterpillar Tractor Co., Dept. D-103, Peoria, Illinois
I would like more information on the new No. 9 Ripper

*Name*_____

*Company*_____

*Address*_____

*City*_____ *Zone*_____ *State*_____

DRAG ROPE LIFE INCREASED 25%

says Correale Construction Company

ESCO LONG BOWL SOCKET GRIPS ALL 6 STRANDS to make rope last longer!

Correale Construction Company operates a *1150-B* Bucyrus-Erie dragline with a 180 ft. boom at a stripping operation near Minersville, Penn. Here are their records on 2½" by 290' ropes, 6 x 19—"W"—I.P.S.—I.W.R.C.:

From January 1947 until April 1951 each set of ropes averages 926,000 yards. *After installing ESCO Long Bowl Sockets in April, rope life was increased to 1,166,000 yards*—about 25%. This is a savings of approximately $500 for each set of ropes or a total of $5000 on the ten sets replaced since April 1951.

ESCO Long Bowl Sockets Can Reduce Costs on Your Job. See your *ESCO* Dealer or write direct.

This is a cutaway view of an ESCO Long Bowl Socket showing grip on six strands.
1
2
3
4
5
6
Compare to conventional socket which grips three strands. Just one more reason why you should insist on ESCO Replacement Parts.

ESCO

ELECTRIC STEEL FOUNDRY COMPANY

GRAB SAMPLES From the Mail

Similar Acid Problem

Dear Sir:

I was very interested in the article on "Underground Mines" in the annual Yearbook on page 43.

We have a very similar problem to the one in New South Wales, Australia, with the acid water, and I should like very much to know which oil company makes the soluble oil "Caltex A."

Thanking you for any information which you may give us on this matter, I remain,

FERNANDO BENITZ
Sali Horhschild S. A.
Santiago, Cuba

The main office of California Texas Oil Company, Ltd. is at 380 Madison Avenue, New York, New York—Ed.

WM "On the Ball"

Dear Sir:

I have found WORLD MINING both interesting and very useful, and it is certainly "on the ball" in recording and describing the latest trends and developments in mining.

I have recently resigned from the position of superintendent of open cut operations, State Electricity Commission of Victoria, Australia, and taken up residence at Tusmore, a suburb of Adelaide, South Australia, where I am a consulting mining and civil engineer. Would you please record my change of address?

HORACE J. EDWARDS
Tusmore, South Australia

Wants More Fission Facts

Dear Sir:

I have been greatly helped by the services of WORLD MINING in giving me invaluable information and keeping me in touch with the up-to-date developments in the mining field.

I would like to see more information regarding the methods of finding and mining atomic minerals in the "Fission Facts" section.

JAI NARAIN
General Manager
Dungarman Sarraf & Sons
Sikar, India

Most Helpful Publication

Dear Sir:

WORLD MINING is a most helpful publication, and is widely circulated among the technical staff of this company and associated companies.

DR. M. D. CARRETTY
Managing Director
Australian Magnetite Pty. Ltd.
Melbourne, Australia

Succinct World-Wide Summary

Dear Sir:

I find that WORLD MINING gives in succinct form an excellent summary of current mining activities on a world-wide basis. Please continue sending it to me.

F. T. M. WHITE
Professor of Mining
and Metallurgical Engineering
University of Queensland
Brisbane, Australia

Mining World

Including the Export Edition **WORLD MINING**

Published monthly except in April when publication is semi-monthly

VOLUME 18 — **OCTOBER 1956** — NO. 11

OPERATIONS—TECHNOLOGY

Milling

How Anaconda Mills Uranium Ore at Bluewater, New Mexico by George O. Argall, Jr. 46

First Full Report on Reserve Taconite by Henry G. Grundstedt 52

Stovall Manganese's Portable Milling Plant 60

Open Pit Mining

How Reserve Mines Taconite at Babbitt, Minnesota 52

Underground Mining

How Mid Continent Uses Drill Holes for Uranium Mine Shafts 62

Money Making Methods

How to Care for Mine Storage Batteries, How China Controls Road Dust 64

IN THE NEWS

International	71	Central Eastern ...	97	Northwest	99
Southwest	94	Iron Ranges	98	Rocky Mountain ...	102

DEPARTMENTS

Grab Samples	2	International Newsmakers	67
Drifts and Crosscuts	5	Fission Facts	69
Capitol Concentrates	7	Metal and Mineral Prices	90
International Panorama	45	Production Equipment Preview ...	92
U. S. Personalities	65	Advertiser's Index	108

ON THE COVER: This is the inside of Anaconda Company's ion exchange building at the new sandstone acid leach uranium mill at Bluewater, New Mexico. The color plates used for the picture were generously supplied by Anaconda. Turn to page 46 for the first full complete report on the new mill.

PUBLISHING OFFICE: Emmett St., Bristol, Conn.

EDITORIAL AND EXECUTIVE OFFICES

121 Second St., San Francisco 5, Calif., CArfield 1-5887

General Manager ..... M. F. Holsinger
Editor ..... George O. Argall, Jr.
Associate Editor ..... Stanley Dayton
Mgr., Eng. Services .. H. G. Grundstedt
News Editor ..... Janet M. Taylor
Assistant News Editor L. A. Charbonneau
Product Editor ..... B. J. Cartier
Production Manager ... J. A. Cheesman
Dist. Mgr., New York .... A. E. Roberts
Dist. Mgr., Chicago ..... R. N. Crosby
Assoc. Ed., Vancouver .. Charles L. Shaw

BRANCH OFFICES: New York 17-370 Lexington Ave., Murray Hill 3-9295, Chicago 26—1791 Howard, Rogers Park 4-3420. Vancouver, B.C.—402 Pender St. West, MArine 7287.

PUBLISHED BY American Trade Journals, Inc.
Wm. B. Freeman, President — L. K. Smith, Vice President
Miller Freeman, Jr., Sec.-Treas.

STAFF CORRESPONDENTS: Africa—Johannesburg, Union of South Africa; Salisbury, Southern Rhodesia. **Asia**—Ankara, Turkey, Kuala Lumpur, Federated Malay States; Tavoy, Burma; Karachi, Pakistan; Seoul, Republic of Korea; Tokyo, Japan. **Europe**—London, England; Vienna, Austria; Stockholm, Sweden; Trondheim, Norway; Paris, France; Redruth, Cornwall. **North and Central America**—Mexico D. F., Mexico; Vancouver, British Columbia. **South America**—Sao Paulo, Brazil; La Paz, Bolivia; Lima, Peru; Bernal, Argentina. **Oceania**—Port Kembla, N. S. W., Australia; Manila, Philippine Islands. Not responsible for unsolicited manuscripts.

Copyright 1956 by American Trade Journals, Inc.

Contents may not be reproduced without permission

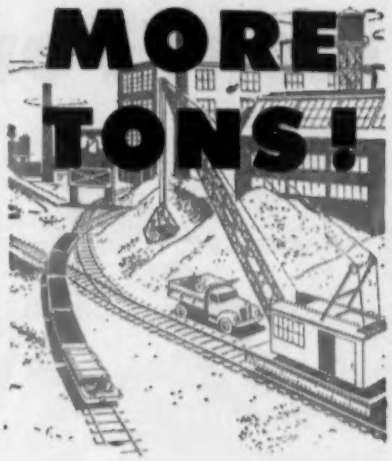
Mining World Subscription Rates

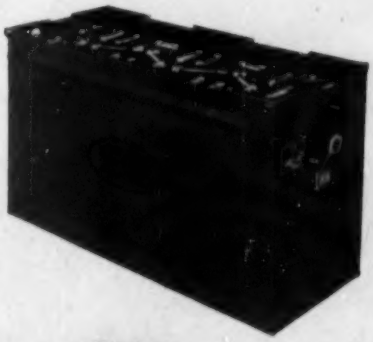
U. S. North, South and Central America $3.00
Other Countries $4.00
Single Copies ..... $ .50
Directory Number $1.00

WORLD MINING is published the 20th of each month as a regular department of MINING WORLD and is also circulated as a separate publication on a carefully controlled free basis to a selected list of management and supervisory personnel associated with active mining enterprises throughout the world.

MILLER FREEMAN PUBLICATIONS

MOVE MORE TONS!





with C&D Slyver-Clad® batteries

C & D's extra high-capacity mining batteries work through a full shift without power let-down. This means locomotives, trammers and shuttle cars keep the day's output moving.

Why? Because with C & D Slyver-Clad® batteries you can get 66 A. H. in a 60 A. H. tray, or 125 A. H. in a 110 A. H. tray. Thus you get more power per cubic-inch of battery—You move more tons—every shift!

For details

Write for cost-cutting mining battery bulletin.

50th

C&D BATTERIES, INC.

of Conshohocken, Pa.

INDUSTRIAL BATTERIES SINCE 1906

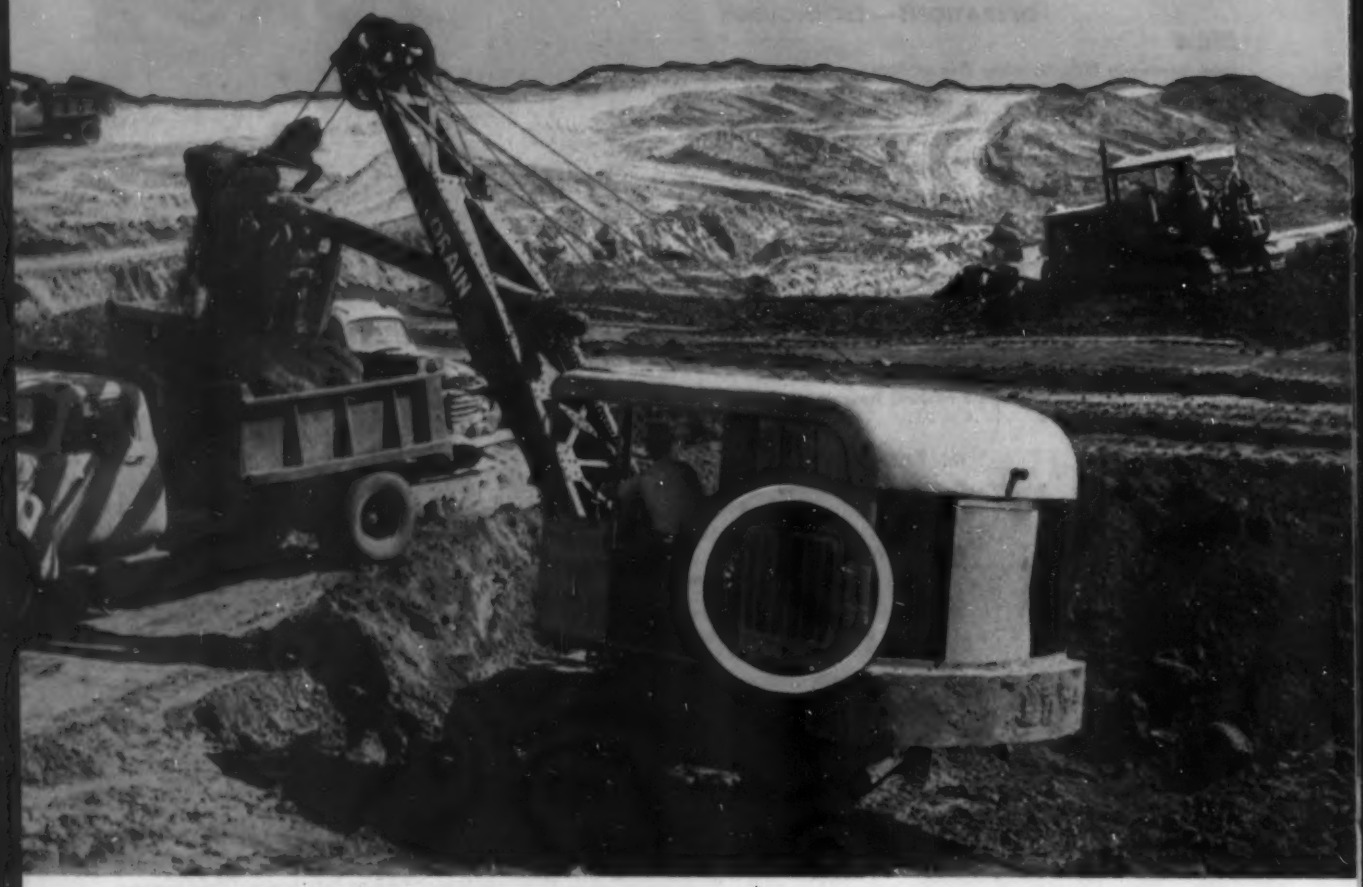
SALES AND SERVICE OFFICES

IN PRINCIPAL CITIES FROM COAST TO COAST

MINING WORLD, October, 1956. Volume 18, No. 11. Published monthly, except April, when publication is semi-monthly at Emmett St., Bristol, Conn. Executive, advertising and editorial offices, 121 Second St., San Francisco 5, California. Subscription in United States, North, Central, and South America, $3.00 per year; other countries, $4.00 per year. Entered as second class matter Oct. 19, 1951 at the Post Office at Bristol, Conn., under the act of March 3, 1879. Postmaster: please send notice 3579 to MINING WORLD, 121 Second St., San Francisco 5, Calif.

HOW TO GET

RIGHT POWER AT LOWER COST



Installed as original power in this ¾-yd. Lorain shovel, a CAT* D4600 Diesel Engine has racked up more than 8700 profitable hours for Glenwood Mining Co., Inc., Glenwood, Ala. The unit stays steadily on the job, digging and loading about 175 tons of brown iron ore per 10-hour day, 5½ days a week, the year around. I. D. Gibson, company president, says, "This Cat Engine has plenty of power, even in hard digging."

Excellent though this engine's performance is, the new line of Caterpillar Diesels will deliver even more power with less down time at lower cost. The Cat D318, for example, is ideal for installation in shovels like the one shown here.

Like all Caterpillar Engines, the 4-cycle D318 is compact for easy installation. It is also available with torque converter for smooth power application and ease of operation. It idles without fouling, and runs cleanly and efficiently even on low-cost No. 2 furnace oil, thanks to its tinker-free Caterpillar fuel injection system. And it owes its trouble-free work life to such quality features as "Hi-Electro" hardened crankshaft journals, aluminum alloy bearings, and highly effective oil and air filters.

Leading manufacturers can supply Caterpillar Engines as original power in their equipment. And your Caterpillar Dealer can install one of these rugged 4-cycle diesels when it's time to repower your present equipment. He will gladly advise you on the engine from the broad Caterpillar line that will suit all your mining operations. Count on him, too, for skilled service and factory parts you can trust. Why not give him a call today?

Caterpillar Tractor Co., San Francisco, Cal.; Peoria, Ill., U.S.A.

CATERPILLAR*

*"Caterpillar" and Cat are Registered Trademarks of Caterpillar Tractor Co

MODERN
HEAVY-DUTY POWER

Drifts and Crosscuts

Platforms Contain Mineral Planks

The mineral plank in the respective platform adopted by the Republican and Democratic parties provide some interesting contrasts.

The Republican mineral policy reads:

"Recognizing that a vigorous and efficient mineral industry is essential to the long-term development of the United States and to its defense, we believe that government should foster a long-term policy for the development and prudent use of domestic mineral resources, and to assure access to necessary sources abroad, without dangerously weakening the domestic market for domestic production of defense-essential materials."

In the phrase "to assure access to necessary sources abroad" there is a definite invitation to invest in foreign mining and the difficulty of reconciling this with "without dangerously weakening the domestic market" is obvious. The key seems to be in the word "dangerously." Who will determine, and will it matter if small miners are wiped out?

The Democratic platform contains the following section on minerals:

"The Republican Administration has seriously neglected and ignored one of the nation's basic industries, metal mining. We recognize that a healthy mining industry is essential to the economy of the nation, and therefore pledge immediate efforts toward the establishment of a realistic, long-range minerals policy. The nation's minerals and fuels are essential to the safety, security and development of our country. We pledge the adoption of policies which will further encourage the exploration and development of additional reserves of our mineral resources."

The fact that fine words sell no minerals or metals should be brought forcibly to the attention of the Democratic party's policymakers.

Anyway, both parties saw eye to eye on the need for the expansion of the government's programs for exploration and research in minerals; and the keynote of the mineral planks in both platforms is a satisfactory long-range mineral policy.

Gold Mine Records Important

With the legal battle successfully drawing to a close which gives the gold mining industry the right to recover damages incurred as the result of World War II War Production Board Limitation Order L-208, the importance of each company's records becomes paramount.

Therefore, complete and accurate records will have to be presented to the Hearing Commissioners covering, among others, these items: cost of closing down mines; maintenance costs from the time of closing until revocation of order on 30 June 1945; actual loss or depreciation in the value of machinery or equipment; cost of reopening mines, where this was done, after end of order; loss of reasonable profits which would have been earned if mine was not forced to close; and for those mines never able to reopen the total investment loss.

Undoubtedly many of the smaller miners will have difficulty in producing complete and accurate records. It is a forgone conclusion the Commissioners will be exacting in their demands.

It's not too early to begin assembling final data for your claim.

We're Pledged to Please...

You are probably familiar with the significance of the ABC symbol which appears on the table of contents page of each issue of MINING WORLD. To earn the right to display this symbol, MINING WORLD must prove that its circulation meets high standards of integrity . . . standards that imply responsibility to readers and guaranteed values for advertisers. Circulation records are audited by representatives of the Audit Bureau of Circulation, a non-profit organization of advertisers, advertising agencies and publications which qualify for membership.

Display of the insignia offers proof to advertisers that their message reaches a guaranteed number of interested readers in a position to purchase advertised products. It is also evidence of recognition of primary responsibility to readers who pay for a needed and wanted publication.

Further, it is a guarantee that MINING WORLD editors will and must continue to devote their efforts to providing editorial content which will attract and hold valued readers. MINING WORLD pledges to readers that they are the people whose decisions and interests govern the policy of this magazine.

Switch to extra-tough AMSCO® MANGANESE STEEL TRACTOR SHOES

When the going is extra tough, as in rocky areas or abrasive mineral soils . . . tractor shoe replacement can become a major cost item. Both repair time and down time eat up profits.

Switch to "the toughest steel known" . . . Amsco Manganese Steel . . . for tracks and grouser bars. Check their much longer service life against the moderate extra cost. Add to this the greater efficiency and pulling power of your tractor, over a longer period of time. The answer: *important operating economies.*

Amsco Manganese Steel gives excellent resistance to abrasion accompanied by impact . . . actually *work-hardens* in use. Write for full information on long-wearing Amsco Manganese Steel Tractor Shoes—the economical answer to high track-replacement costs.

COUNTER-SUNK BOLT HOLES

Amsco Track Shoes have holes counter-sunk for less wear on bolts. Saves cost of replacing bolts when changing shoes.

AMERICAN Brake Shoe COMPANY

AMSCO

American Manganese Steel Division • Chicago Heights, Ill.

OTHER PLANTS IN: DENVER, LOS ANGELES, NEW CASTLE, DELAWARE, OAKLAND, ST. LOUIS; JOLIETTE, QUEBEC

Capitol Concentrates

Why Don't Government Agencies Act Promptly To Implement Laws?

It is an extraordinary commentary on the slowness of government agencies in getting things done that Public Law 733, the mineral purchase program, was signed into law on July 19, 1956, by the President, yet up to August 30 no regulations had been issued. It is to be hoped something will be done before this item is printed.

Advices from Washington are to the effect that, as of the above date, the new tungsten regulation will be ready to issue in a few days, but that nothing has been done about asbestos, columbite, or fluorspar.

The Secretary of the Interior, a few days after the law was approved by the President, issued a directive to the General Services Administration to draft regulations and to be the purchasing agency as in the past, although the new law places the final responsibility upon Secretary of the Interior Seaton. Why all the delay is hard to understand. GSA already had regulations for everything but fluorspar. It did not take the Office of Defense Mobilization long to have most of its new regulations published, as all that was necessary was to amend the old ones with changes in closing dates and, in some instances, changes in quantity. The same thing could be done by GSA with asbestos and columbite. The fluorspar regulation should almost write itself as the law is specific. The tungsten program was changed by the Engle amendment so that perhaps two days thought would be needed to put out an amended regulation. When the Congress determines that something should be done for the mining industry, the Administrative agencies should put the program into operation with the greatest expedition possible rather than drag their feet.

SEC Tightens Rules, Proposes New

New and tougher regulations governing small stock issues have been issued by the Securities and Exchange Commission. In addition, the SEC has singled out for special treatment the so-called promotional companies—generally those companies organized less than a year before filing plans to sell stock.

The new rules broaden the grounds on which SEC can deny use of Regulation A to a firm, or later block sale of an issue; require more infomation on notifications form filed with the SEC; require firms to up-date their offering circulars every nine months if an issue has not been sold out; and make it easier for the commission to keep track of securities sales and use of proceeds.

Special rules for promotional companies require the use of an offering circular in connection with a registration-exempt issue, even if the issue totals less than $50,000. Additional restrictions on the availability of the exemption are imposed if any of the promoters, management officials, or underwriters have a record of past securities violations.

Proposed for public comment are new revisions which are concerned particularly with the sale of so-called 'penny stocks' by new companies which have availed themselves of the exemptions from registration provided by Regulations A and D. According to Commission Chairman J. Sinclair Armstrong, the suggested revision would restrict the availability of the exemption to what might be termed 'seasoned' companies. Specifically, it is suggested the exemption be made available only to companies which show a net income for at least one of the past five years, or which limit their offerings to not more than 100,000 units in the case of equity securities and 3,000 units in the case of debt securities. Alternative proposals under consideration would require the issuer to meet both tests.

Policy Statement Is Promised

Representative Clifton Young of Nevada has made the public statement that: "I have been assured personally by the Honorable Fred Seaton, Secretary of the Interior, that the long-awaited long-range minerals program will be ready for Congress in January."

This is the program that Seaton promised (at his Senate confirmation hearing) he would deliver to the 85th Congress early in the first session. However, observers close to the Interior Department say that so far they can see no signs of such a program being evolved, nor have they been able to ascertain on what sort of over-all policy it will be based. Certainly it would be difficult to wrap proposed legislation around the vague policy statements in the report of the President's Mineral Policy Committee.

One thing is sure. If Seaton does not come through with something really constructive, the Congress will be disposed to act independently or to force action by means of a joint resolution such as S.J. Res. 148, 84th Congress.

Mine Safety Hearings Are Being Scheduled

Congressman Metcalf's special subcommittee on mine safety plans to inspect mines and hold hearings in Montana and Colorado this fall, following hearings in the iron mining region of Minnesota. In November or December, Metcalf plans full-scale hearings in Washington, D.C., with testimony by mine management and labor, the U.S. Bureau of Mines, U.S. Public Health Service, and others interested in mine safety legislation which will be introduced soon after Congress convenes in January.

Idarado Mining Co. reports:

No Cutoffs, Fewer Bootlegs, Increased Safety with Du Pont Blasting "Team"!

1 **PUTTING "TEAM"** to work in the stopes of Idarado Co.'s lead-copper-zinc mine, Ouray, Colo. — priming 1⅛ x 16 "Gelex" No. 2 with Du Pont MS (millisecond) Delay Electric Cap. With their 19 delay periods (MS-25 to -1000), these caps "fit" whatever shooting pattern the rounds demand.

2 **LOADING PRIMER** into vertical hole. Changing from cap and fuse to electric blasting with Du Pont MS Delays gave greatly improved fragmentation, fewer bootlegs (which gave a safer and more solid back), fewer loose slabs on the hanging wall and no unexploded powder in the muck.

3 **CONNECTING** up round with MS Delays. The Idarado Mining Company also found increased safety through the elimination of smoke from the fuse, thus permitting ample time for exit from the stope before the shot is fired.

4 **RESULTS:** plenty of well-broken rock. Consistently, round after round, Du Pont's dependable team of MS Delays and "Gelex" No. 2 gives excellent breakage, with safer, more solid back, and no dynamite in the muck.

• Contact your Du Pont man for complete details, or write: E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

DU PONT EXPLOSIVES

Blasting Supplies and Accessories

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING ... *THROUGH CHEMISTRY*

Powerful crowding action fills this big, half-yard capacity bucket in any muck pile. Fast discharge and near-perfect clean-up at the face are time-saving abilities of the Eimco 630.

An Eimco 630 "moves in" for another load, operated by easy-to-reach, easy-to-work controls.

The Eimco 630 Crawler-Excavator is gaining more respect for its adeptness in a greater variety of underground mucking tasks by responding favorably to new tests of its versatility.

One recent field report points to an Eimco 630 Transport-Loader that has been loading rounds much faster and getting better "clean-outs" during five months of competition with a 48" box scraper with a 50 h.p. slusher.

Near-perfect clean-out by the 630 increases drilling efficiency. To get 630 clean-out results in a slusher operation, requires use of snatch blocks along the foot and hanging walls and final clean-up at the face thru hand shoveling.

So outstanding has been the Eimco 630's performance, future stopes are being planned for maximum utilization of its many operating advantages.

The 630 Transport-Loader with integral, automatic discharge, 30 cu. ft. hopper, is very profitably in use for short hauls and floor-level dumping in a wide variety of industries.

And—like all 630 excavator-dozer units, the transport loader has that extra maneuverability thru independent track operation—control simplicity and the big, half-yard bucket capacity.

BEFORE YOU DECIDE ON A MINING PATTERN, investigate the EIMCO 630. You'll find—as others have—it pays to plan your mining strategy around operating advantages of the versatile 630.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Baltimore, Md. Pittsburgh, Pa. Seattle, Wash. Cleveland, Ohio Houston, Texas Vancouver, B. C. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

B-838

Prospecting. The Universal 'Jeep'* with the extra traction of its 4-wheel drive, takes men and equipment anywhere on the lease for prospecting, exploring or survey work. It climbs grades as steep as 60%, goes where other vehicles can't go.

Speed your mining operations with 'Jeep' versatility and all-wheel traction!

Transportation. The 4-Wheel-Drive 'Jeep' Truck transports men and equipment around the mine or between mines. Its all-wheel traction gets men, supplies and equipment wherever needed.

Mobile power. The versatile 'Jeep' gets to the job with sure dependability, and with power take-off supplies its own power to operate a portable drill, above. It also operates winches, welders, compressors, generators and many other types of equipment.

Rugged 'Jeep' vehicles are always on-the-job, in virtually every phase of mining. From initial surveys to transportation of men and equipment in the field, they help keep operations on schedule every day of the year.

No other vehicles match the 'Jeep' family for all-around mobility, range of performance and go-anywhere ability. On the highway they travel at top legal speeds in conventional 2-wheel drive. But, when the going gets tough, the extra traction of their 4-wheel drive hauls trailers in trackless mining, or carries personnel with parts and supplies over rugged terrain, through mud, snow or soft earth — in good weather or bad — to help keep maintenance and service work moving smoothly. These vehicles go where others stop cold in the heavy, rough going of mining projects.

'Jeep' vehicles supplement heavy-duty equipment, spread their costs over a wide variety of jobs, give you additional savings through long life and low maintenance costs. Ask your Willys dealer for a practical, on-the-job demonstration.

The 'Jeep'®

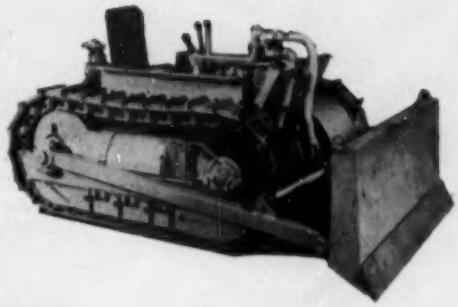
family of 4-Wheel-Drive Vehicles

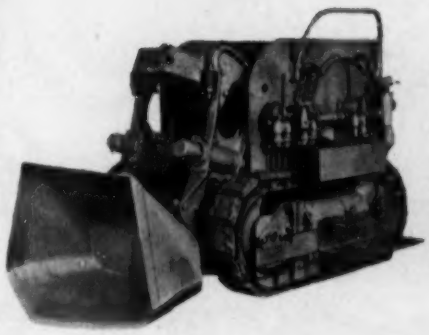
WILLYS... makers of the world's most useful vehicles

**Model CJ-5 shown*

WILLYS MOTORS, INC., TOLEDO 1, OHIO

NOW! IN CRAWLER TYPE MACHINES FOR TRACKLESS WORK, THE SAME HEAVY RUGGED CONSTRUCTION AND DEPENDABILITY THAT THE INDUSTRY HAS HAD IN EIMCO WHEEL TYPE MACHINES.





Fast, sharp maneuvers, regulated by fingertip control make the EIMCO 630 EXCAVATOR a production giant and an operator's delight.

With the power at his fingertips to move one track into forward motion while the other is in reverse motion, an operator can make the 630 veritably "walk" around a muck pile—working from any angle without backing to make a new approach.

Eimco 630 agility permits operators to quickly master movement of the machine to a point that lost motion is eliminated between excavating and discharge stages.

While the 630 is moving between points of excavation and dumping, the bucket progressively elevates in an arc. Through proper timing, arrival of the 630 and bucket discharge become simultaneous operations. And the large half-yard bucket provides greater tonnage at every discharge.

These three pluses—extra maneuverability, operational ease and larger bucket capacity added in terms of economic value to you mean MORE TONNAGE IN LESS TIME.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kalispell, Mont. Baltimore, Md. Pittsburgh, Pa. Seattle, Wash. Pasadena, Calif. Houston, Texas Vancouver, B. C. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

B-815

Mack diesel dumper used to haul crushed stone and agricultural limestone from the quarry of the Waukesha Lime & Stone Co., Inc., Waukesha, Wis. In operation since 1905, this quarry is presently producing at a rate of 500,000 tons per year.

Macks make your other equipment investments pay off

For a work-speeding, profit-making combination, team up your big shovels with Mack trucks.

Macks keep shovels on the go because they make fast hauls between mine or quarry and unloading site. They can be depended upon to meet schedules because Macks don't bog down or break down when the going gets tough. They handle the heaviest loads under the toughest conditions. They require minimum maintenance and provide maximum fuel economy.

Whether you utilize trucks for removing overburden . . . for hauling ore from open pit mines . . . or in quarrying operations—putting Macks on the job will pay off because they make possible the most profitable use of machinery and manpower. Investigate Mack trucks today. Contact your nearby Mack representative.

MACK TRUCKS, INC., Plainfield, New Jersey. IN CANADA: Mack Trucks of Canada, Ltd.

3603

EIMCO 105 -- MORE POWER FOR MORE WORK

Eimco 105 Tractor-Excavators are balanced to give maximum work efficiency in every phase of digging and loading. Compare these figures—(A) 39,200 pounds of digging force at the bucket lip as the 105 moves into the rock pile; (B) 39,200 pounds of lifting capacity for break-out power.

This power gives the operator the same potential in productive capacity as he would have if you bought him a boom type shovel costing three to four times as much.

How does Eimco design a small (1½ yard) Tractor-Excavator to outproduce every other machine in its price range?

The answer to this is Eimco's unique Tractor design which provides better balance, lower center of gravity and delivers full engine horsepower to the bucket at all times.

Eimco also makes it easier to operate the 105 Tractor-Excavator. The operator sits up front where he can see what he is doing. Two small handles, easily held in one hand, control all movements of the Tractor. The operator does more work with less effort, stays efficient the entire shift.

Other firsts in the Eimco 105 Tractor-Excavator include (1) independent track control so that one track can be run forward while the other turns reverse; (2) separate final drives for each track; (3) full track oscillation on the tractor when equipped with loading or excavating attachment; (4) elimination of master clutch and drag-track steering; (5) Unidrive transmission in which gearing always rotates in the same direction; (6) all alloy steel construction; (7) clutches that never need adjustment — and many other exclusive features.

See these completely new tractors as Bulldozers, Excavators or Loaders working near you. Write for complete information.

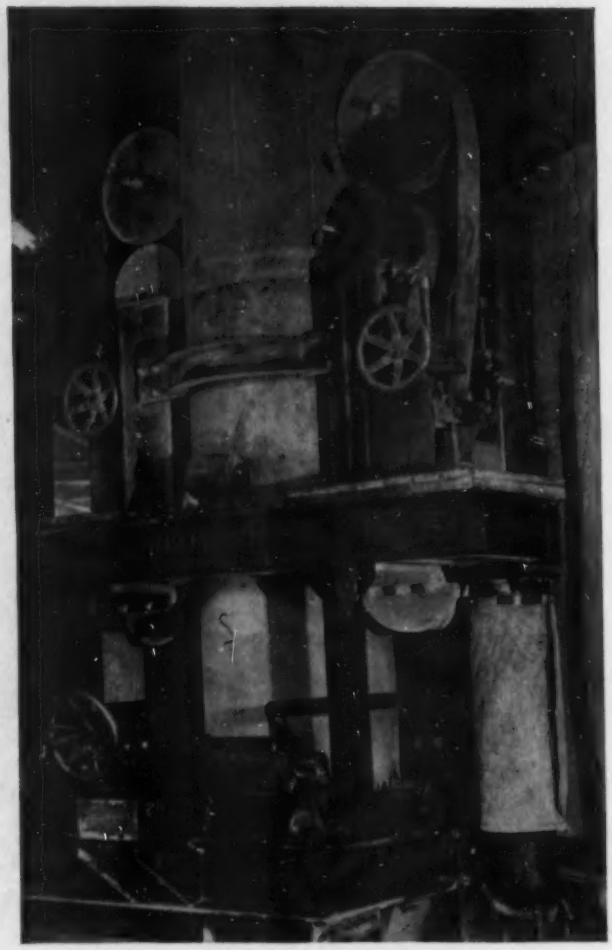
THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kellogg, Ida., Baltimore, Md. Pittsburgh, Pa. Seattle, Wash. Cleveland, Ohio Houston, Texas Vancouver, B. C. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

B-222

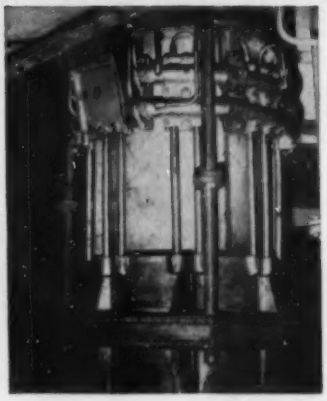
At Ferro-Metals in South Africa, Lectromelt* Furnace Equipment



DEPENDABILITY designed and built into Lectromelt furnace equipment accounts for its widespread use around the world. Because furnaces are often installed at mine mouths and other out-of-the-way places, they must operate with a minimum of down-time for repairs.

VERSATILITY demonstrated by Lectromelt furnaces throughout the past forty years makes them readily adaptable to variations in processes. Experience gained by Lectromelt engineers on electrothermic problems enables them to advise you on the use of electric-arc furnaces in high temperature chemistry.

For this help and for a copy of Catalog No. 105, write Electrothermic Division, Lectromelt Furnace Company, 324 32nd Street, Pittsburgh 30, Pa. (a McGraw Electric Company Division).



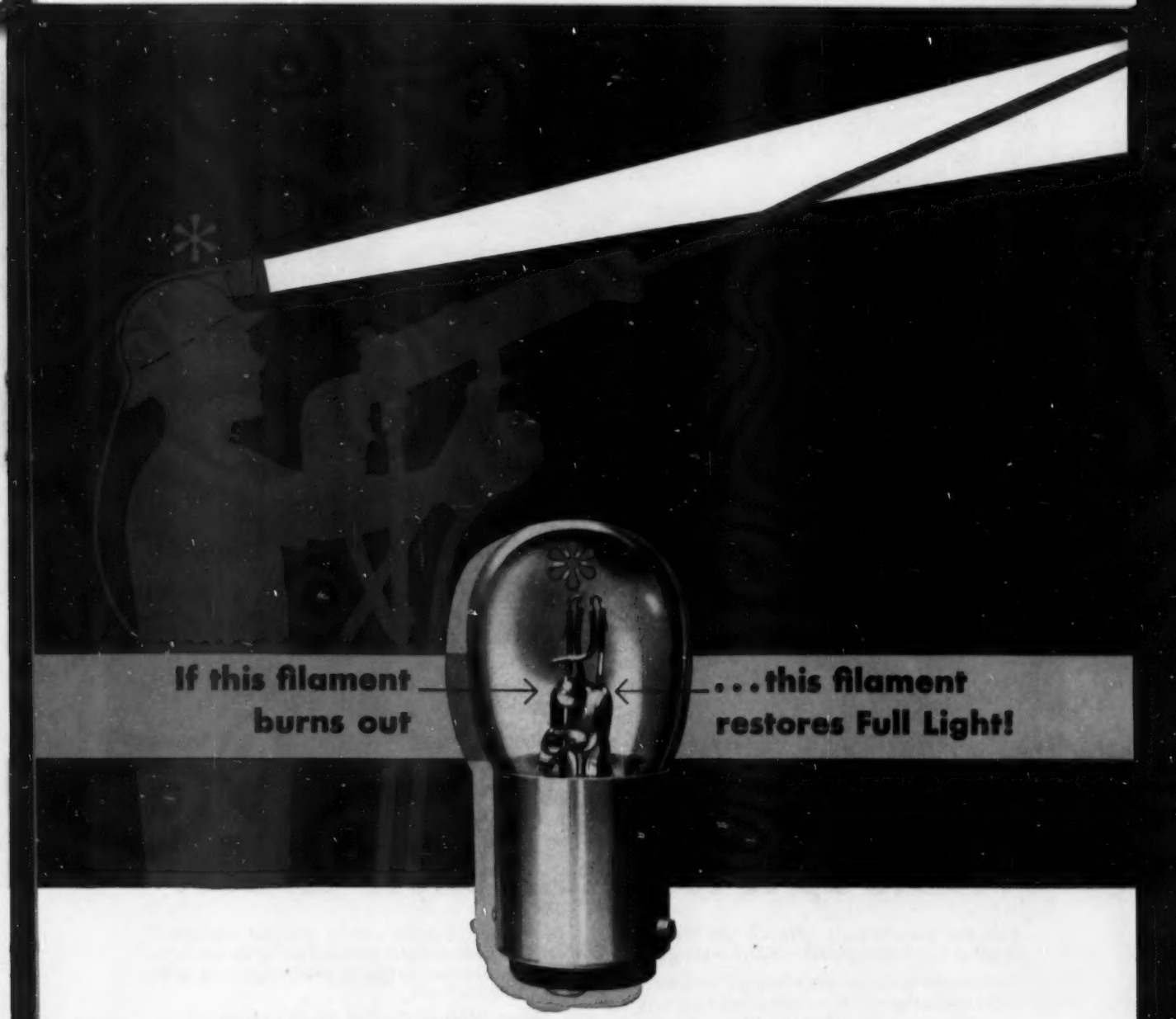
Two 7500 KVA Lectromelt Furnaces with 35-inch self-baking electrodes are employed by Ferro-Metals on ferroalloys and ferrosilicons.

Manufactured in . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa . . . JAPAN: Daido Steel Co., Ltd., Nagova

*REG. T. M. U. S. PAT. OFF.

MOORE RAPID

WHEN YOU MELT... *Lectromelt*



Man-hour protection for working crews . . . the Edison R-4 double-filament bulb

Working crews are assured greater underground safety, more productive man-hours because the Edison R-4 double-filament bulb is on the job.

Miners equipped with this bulb know that burn-out doesn't mean blackout. If one filament burns out, a turn of the switch transfers the power of the unfailing Edison battery to the second filament—continued, brilliant illumination is restored for the full shift. There's no lost time for the miner, or short crews for the foreman. There is only *one bulb*, located in the center of the headpiece, which gives the advantages of maximum reflector area.

This kind of reserve light protection means that hundreds of man-hours may be saved every year. The result is increased production with an added margin of safety. Our bulletin gives complete details. Write for your copy.

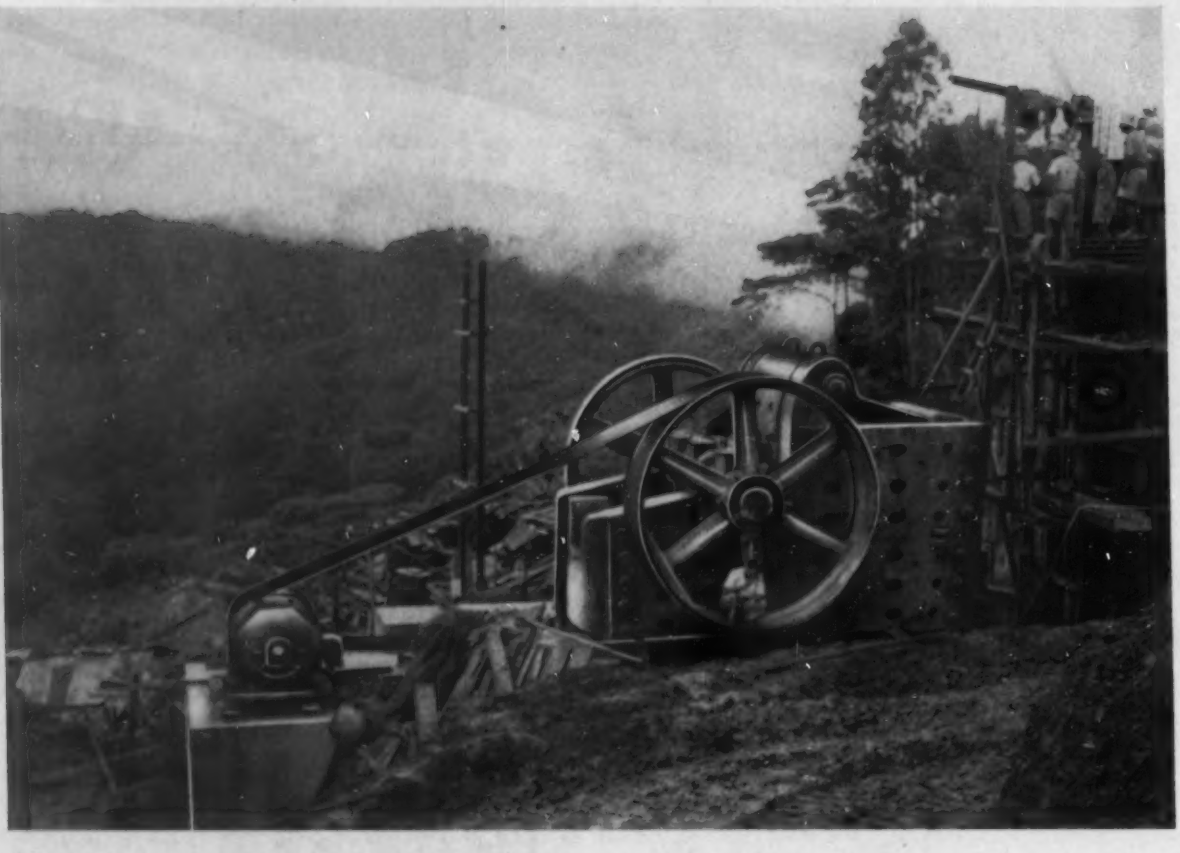
Edison R-4 Cap Lamp . . . ideal for self-service systems.

MSA
SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M-S-A is at your service . . . our job is to help you

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 77 Branch Offices in the United States and Mexico

MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S.



Traylor All Steel Jaw Crushers reduce up to 1000 tons of ore an hour

For ore reduction, a Traylor All-Steel Jaw Crusher is a top producer. For 2 reasons:

—Traylor's heavy duty rugged construction provides strength to withstand long periods of continuous operation without down-time losses.

—Traylor's curved jaw plates just about eliminate lifting and churning of material in the crushing chamber to reduce power waste and greatly increase production efficiency and capacities.

In addition, Traylor curved jaw plates outwear conventional straight plates often by as much as 3 to 1, further reducing production loss and maintenance costs.

Four types of Traylor Jaw Crushers offer a wide range of capacities from 4 to 1,000 tons per hour with product sizes from 7/8" to 11".

Traylor engineers are at your service to advise which Traylor Jaw Crusher is best suited to meet your plant requirements. There's no obligation for their recommendations. Just drop us a line today.

TRAYLOR ENGINEERING & MFG. CO.
803 MILL ST., ALLENTOWN, PA.
SALES OFFICES: New York • Chicago • San Francisco
Canadian Mfr: Canadian Vickers, Ltd., Montreal, P.Q.

A Traylor leads to greater profits

Mark of Integrity

...in reporting circulation facts

We display the Audit Bureau of Circulations* symbol with pride! It's our mark of circulation integrity!

The seasoned marketing man finds trustworthy data vital in his work of advertising media evaluation. And *reliable net paid circulation figures* are among the most valuable facts he uses in selecting printed media for his advertising campaigns.

Once every advertiser guessed about circulation accuracy and gambled on advertising results; today he need not question the wealth of data in any A.B.C. audit report, for it contains only *verified* answers to his most searching circulation queries.

* * *

*The Audit Bureau of Circulations, founded in 1914, is a cooperative, nonprofit association of the leading buyers and sellers of advertising space. A.B.C. sets standards for net paid circulation, audits and reports circulation facts. **To be sure of what your print media dollar buys—look for the A.B.C. symbol.**

When a media director or advertiser asks us, "How much paid circulation? What do your readers pay? Where does your circulation go? How do you get circulation—your audience for my advertising?", we need only show him our latest A.B.C. audit report. There he finds factual answers that annually pass the test of a trained A.B.C. circulation auditor's scrutiny.

And any buyer of space can decide for himself, with confidence, the value of our circulation audience. Our A.B.C. membership means circulation reported in accordance with recognized, impartial standards, established by buyers and sellers of space working together in A.B.C.

Publishers who meet the Bureau's high standards know the A.B.C. symbol as a mark of circulation integrity. The value-wise advertiser, too, has learned that *the A.B.C. symbol is his dependable guide to the audited facts* about net paid circulation that protect his advertising investments.

MINING WORLD

MEASURE OF SERVICE...MARK OF INTEGRITY

More Opportunity Chemicals from General Mills

Recover lean non- efficiently with

General Mills cationic reagents are used to concentrate phosphate in this Florida ore beneficiation plant. The chemicals are noted for purity and exceptional selectivity.

CHEMICAL DIVISION OF

sulfide minerals more these flotation reagents

General Mills Aliphat 44 Series (anionic) and Alamine and Alamac (cationic) flotation reagents recover lean non-sulfide minerals quickly with a high degree of concentration. These are fatty acids, primary fatty amines and amine salts. They have a proved record of performance in the most difficult operations. As a result, they are becoming increasingly popular with exacting ore processors. It's time you investigate their money-saving possibilities—take advantage of their uniform high quality.

ALAMINES AND ALAMACS (cationic) ***tallow and hydrogenated tallow amines.*** Always of uniform, high quality, Alamines and Alamacs are used in volume to concentrate phosphate and feldspar. They are also effective collectors of mica and quartz. The distilled grades are widely accepted in the potash industry where maximum purity is essential to good metallurgy.

ALAMINE AND ALAMAC SPECIFICATIONS

Product	Description	Primary Amine Content %	Amine Number*	Iodine Value
Alamine 26	Primary tallow amine	87 min.	192 min.	35 min.
Alamine 26D	Distilled primary tallow amine	97 min.	207 min.	35 min.
Alamine H26D	Distilled primary hydrogenated tallow amine	97 min.	207 min.	6 max.
		Amine Value	Percent Neutralization	
Alamac 26	Primary tallow amine acetate	154 min.	97-103	28 min.
Alamac 26D	Distilled primary tallow amine acetate	164 min.	97-103	28 min.
Alamac H26D	Distilled primary hydrogenated tallow amine acetate	162 min.	97-103	5 max.

**mgKOH equivalent to 1 gram of amine*

ALIPHAT 44 SERIES (anionic) ***fractionally distilled tall oil fatty acids.***

The Aliphat 44's are predominately oleic and linoleic acids and are exceptionally good collectors of fluorspar, barite, phosphate, kyanite, spodumene and scheelite. They also merit your attention in collecting hermatite, various manganese minerals, talc and cement rock.

General Mills Alamines and Alamacs are produced to rigid specifications under constant quality control. You're assured of a uniform product every time you order.

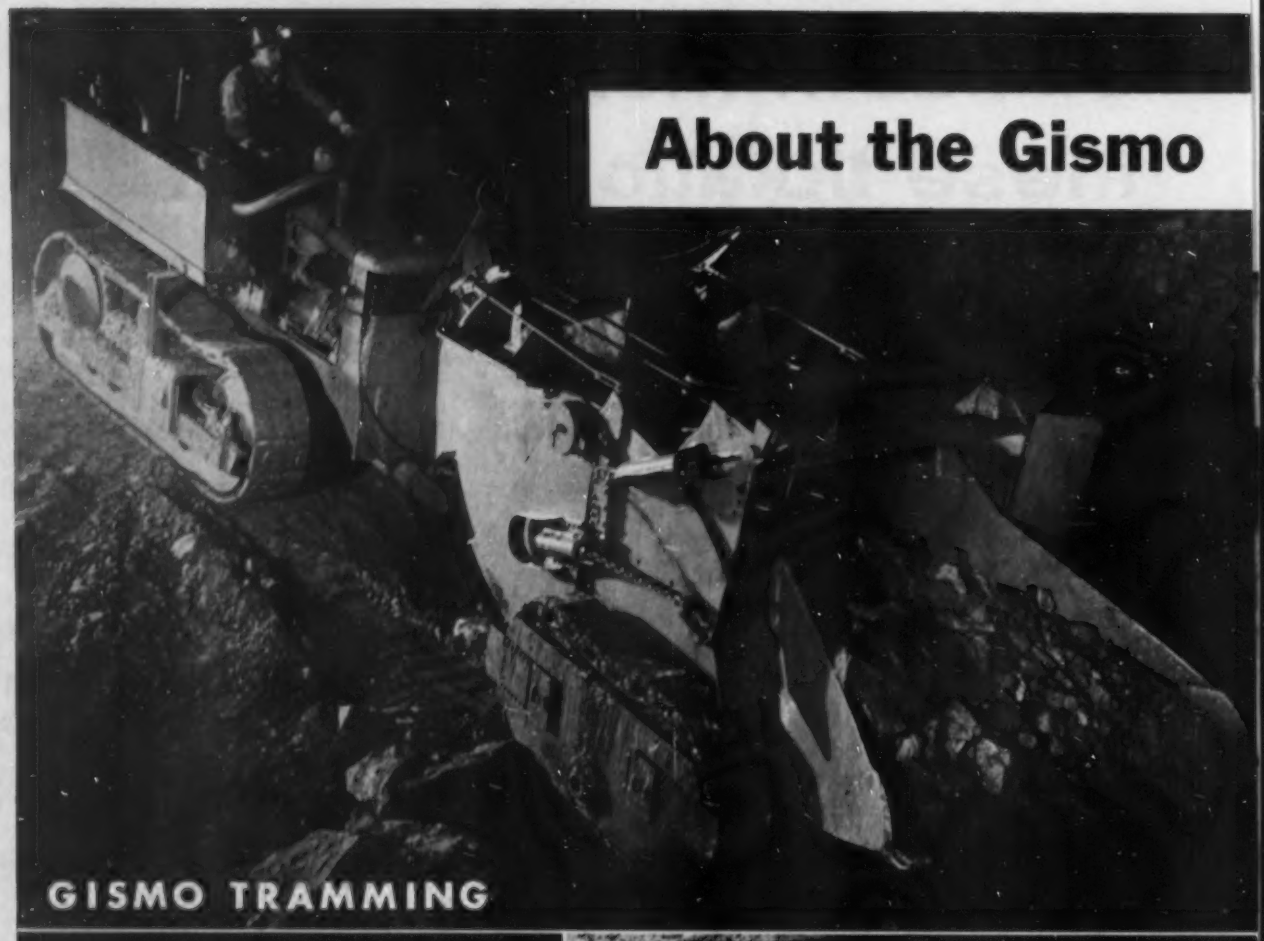
General Mills

KANKAKEE, ILLINOIS

General Mills is a dependable source of supply for these organic chemicals:

- *Fatty Acids*
- *Methyl Esters of Fatty Acids*
- *Fatty Nitrogens*
- *Versamid Polyamide Resins*
- *Sterols*
- *Tall Oils*

About the Gismo



GISMO TRAMMING

LOADING

DRILLING

DUMPING / IN PRODUCTION

DUMPING / IN S-D CARS IN DEVELOPMENT

equipment– what are the facts?

Unquestionably, tomorrow's production economies and records in profitable mining operations will be the direct result of management's selection of proper equipment . . . equipment around which a simple production method can be devised. And certainly the major prerequisite to maximum simplicity is *minimum equipment, minimum labor with maximum production of both.* A plan conceived and organized by management around the criterion simplicity becomes increasingly efficient.

We believe the use of the Gismo equipment offers management the logical opportunity of devising a simple production plan. Quite successful systems organized and built around the Gismo have not only resulted in great economy in use of labor and equipment, but have practically eliminated deficiencies of time cycling operation.

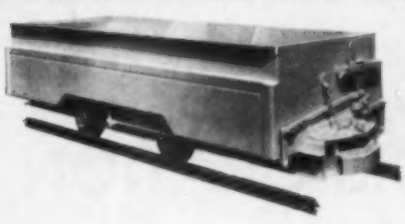
Three men with one Gismo Self-Loading Transport, one Gismo equipped as a 4-drill stoping jumbo and a Gismo tractor have produced over a long period of time in excess of 400 tons per shift. Much less stoping space was required by the Gismo method. The simplicity of the operation together with the greatly reduced manpower made it possible for supervision to practically eliminate the problem of close co-ordination and time cycling between the various departments of the mine such as drilling, blasting, loading, transporting, hoisting and general services.

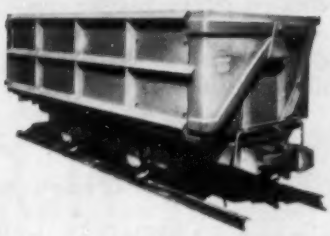
We realize producing such tonnage for so few dollars is a tremendous step forward. The natural reaction is to believe you are reading fantastic figures and statements. Nevertheless, all these facts are very true and they could mean but one thing. With the use of the Gismo equipment you are now free to organize the simple production method you have always strived for but have not been allowed to obtain because equipment permitting simple systems to function has not been available until now.
Sanford-Day Iron Works, Inc., Knoxville, Tennessee, USA

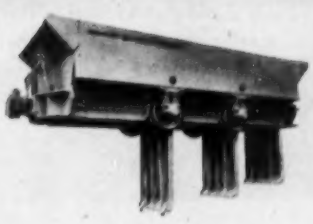
We believe it is vital for mining management to become informed on how the Gismo equipment would fit into their operation. The advantages of this tremendous step forward have resulted in some companies abandoning well set plans to purchase other types of equipment in favor of investing in the Gismo. They found upon investigation, as we believe you, too, will find, that the economies offered by the Gismo equipment and the simple method of mining it enables you to organize are far greater—entirely too great to temporarily pass off simply as a new type of equipment. In fact, so great are its potential economies that this equipment could easily mean in but a few years the difference between profit or loss.

SANFORD-DAY

"SUPER MARKET FOR MINE CARS"—all types • PRECISION WHEELS
BROWNIE HOISTS, CAR RETARDERS, SPOTTERS • THE NEW GISMO





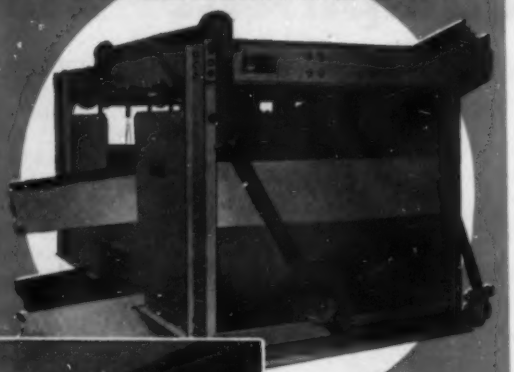


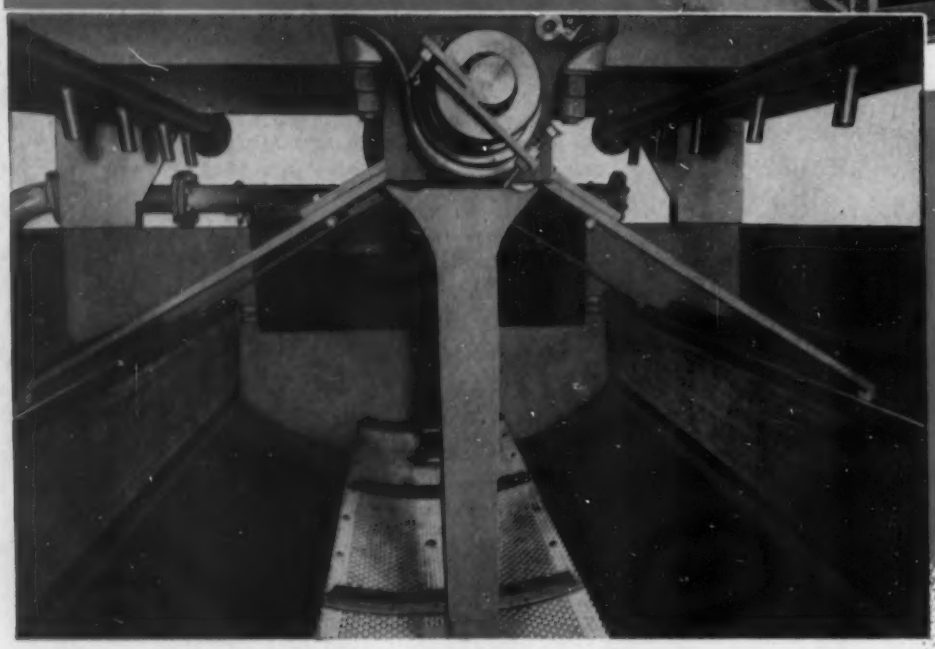
044

Now...BETTER HM SEPARATION

with OCC Vessel

because of its large productive pool area





Left, view of the interior of the OCC Heavy Media Vessel, illustrating its large pool area; view is from discharge end of vessel. Above, exterior view: float and sink discharges at left and feed chute on right.

U. S. and Foreign Patents Pending

Simplicity of OCC Vessel Introduces Broad Operating Economies

Since the introduction of the Heavy Media process, the development of a separator whose simplicity would match that of the process has been an aim. This has been achieved through the design of the OCC Vessel illustrated above. The rake suspended in the center oscillates the width of the vessel. In so doing, it maintains in productive use practically the entire volume of the vessel, in contrast to other separators employing only a fraction of same. The result is improved metallurgy and increased economy.

The remarkable simplicity of the vessel is pointed up by the fact that the rake, the only moving part in the vessel, performs not only the function of removing the sink but also that of keeping the medium in suspension. Let us send you details of how the OCC vessel can increase your operating profits, and reduce maintenance costs in an HMS plant.

OCC

Send for information on pilot plant demonstration & testing services.

THE ORE & CHEMICAL CORPORATION

Division: Mining & Milling Machinery • 80 BROAD ST., NEW YORK 4, N. Y.

"Sunday-Punch"

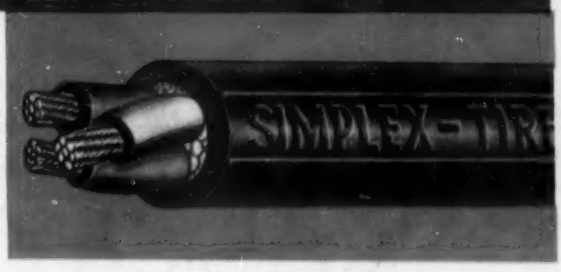
The pin-point blasting that rips away the side of a hill for strip mining is just one of the many mining operations in which Simplex products play an important part. Simplex-TIREX trailing cords and cables, engineered especially for mining work, are on the job in and around mines everywhere. TIREX cables are newly improved for greater flexibility. Their cured-in-lead Neoprene Armor resists abrasion, oil, heat and water, and gives longest life.

SIMPLEX WIRE & CABLE CO.,
79 Sidney Street, Cambridge 39, Massachusetts.

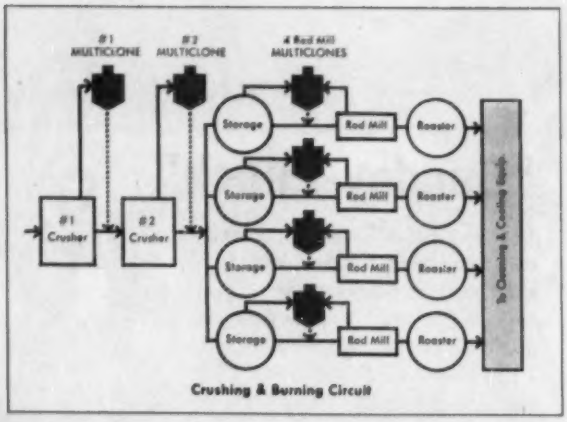
LIVE BETTER ELECTRICALLY

Simplex

TIREX



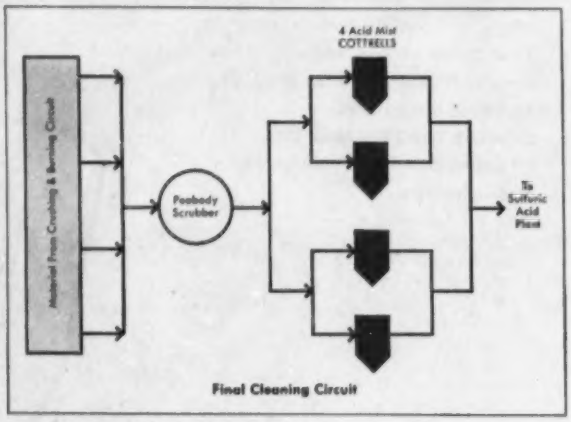
6 MULTICLONE DUST COLLECTORS



Crushing & Burning Circuit

and 4 Western Precipitation COTTRELLS *serve Anaconda at Yerington!*

These Cottrells are the newest Western Precipitation acid mist design



Final Cleaning Circuit

Anaconda selected six Western Precipitation MULTICLONES and four Western Precipitation COTTRELL Electrical Precipitators to handle key recovery operations at its new $30,000,000 Yerington installation.

THE 6 MULTICLONES are installed in the sulfur crushing plant where sulfur ore is crushed and ground for use in the Roaster operations. Since this crushing and grinding develops a considerable dust problem, the primary crusher (a jaw type), the secondary crusher (a cone type), and each of the 4 rod mills has an individual 9VG Multiclone Mechanical Collector installed for recovering suspensions from the exhaust gases.

So efficient are these Multiclones that the exhaust gases are practically free of all visually discernible dust!

Inasmuch as each crusher and mill has its own Multiclone unit, maximum flexibility in plant operation is achieved—with greatly simplified duct and dampering requirements. Savings in plant maintenance are also obtained by having the Multiclones ahead of the fans so that abrasive dusts are removed and only the clean gas reaches the fan equipment.

THE 4 COTTRELLS are installed in the acid plant process to electrically precipitate the acid and water mist from the SO_2 gas generated in the Fluosolid Roasters. From the Cottrells the gas passes directly into the contact acid plant where it is converted into sulfuric acid.

The four Cottrells have 100 pipes each, and are designed for a capacity of 33,900 cfm at 110°F. with a negative pressure of 30" w.g. and a recovery efficiency of 99.0%!

These Cottrells are the first acid mist precipitators to incorporate a new advancement developed by Western Precipitation engineers... top support of the high voltage electrode system coupled with wind-swept insulator compartments. This new design eliminates difficulties associated with conventional oil-sealed insulator compartments and is a major advancement in this type of Cottrell design.

This installation is one more example of the adaptability of Western Precipitation equipment to varying operating requirements. Let our experienced engineers study your particular problem and make helpful recommendations. No obligation, of course!

® "Multiclone"

COTTRELL Electrical Precipitators
MULTICLONE Mechanical Collectors
CMP Combination Units
DUALAIRE Reverse-Jet Filters
HOLO-FLITE Processors

Western Precipitation Corporation

Designers and Manufacturers of Equipment for Collection of Suspended Material from Gases ..and Equipment for the Process Industries

Main Offices: **1036 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA**

Chrysler Building, New York 17 • 1 North La Salle Street Building, Chicago 2 • Oliver Building, Pittsburgh 22 • 3252 Peachtree Road N. E., Atlanta 5 • Hobart Building, San Francisco 4

Precipitation Company of Canada Ltd., Dominion Square Building, Montreal

Representatives in all principal cities

CAT* Motor Graders—now more than ever PROFIT MAKERS FOR YOUR MINE

This Caterpillar No. 12 Motor Grader works two shifts a day, six days a week the year around for the Tecumseh Coal Corp. of Boonville, Ind. Around-the-calendar Caterpillar dependability is traditional in mining work, where these versatile yellow motor graders find wide application in haul road construction and maintenance, snow removal and cleanup.

There are three Caterpillar Motor Grader models: the heavy-duty No. 12 with exclusive oil clutch, the No. 112, and the compact No. 212. Any one of them can reduce wear-and-tear on hauling equipment and step up cycle times with fast, smooth haul roads in *your* mine.

In the long run, Caterpillar Motor Graders cost *less* than other makes. Their economical, four-cycle diesel engines deliver full and foul-free power on inexpensive, non-premium furnace oil. Rugged construction and Caterpillar craftsmanship keep them on the job and out of the shop, and give them high resale value.

All Caterpillar Motor Graders are now available with tubeless tires at no extra cost. Tubeless tires save the cost of tubes and flaps, eliminate 80% of tire down time, and deliver longer casing life and more recaps because they run 10 to 15 degrees cooler.

Caterpillar Motor Graders are built—not merely assembled—by a single manufacturer. Engine power, blade capacity and working speed are carefully matched for maximum efficiency and long work life. All parts and service are available from one dependable source: your Caterpillar Dealer. Ask him to demonstrate the excellent visibility, quick-acting, positive controls and balanced traction that will make a Caterpillar Motor Grader the fast-working favorite of operators in *your* mine.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

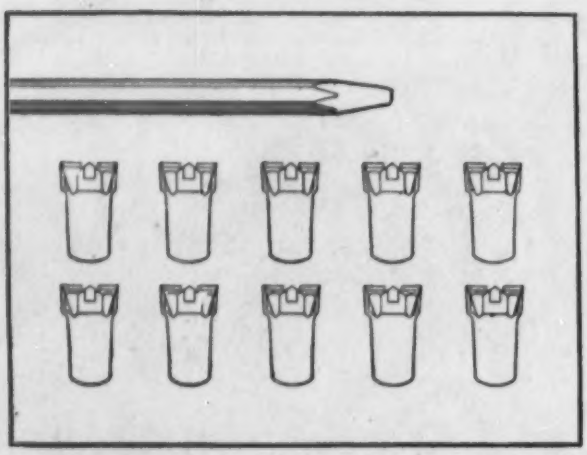
CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

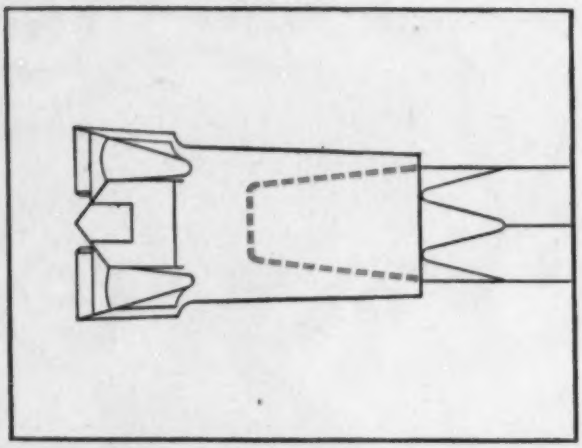
99% OF ALL CAT MOTOR GRADERS EVER BUILT ARE STILL IN USE

New Timken® tapered

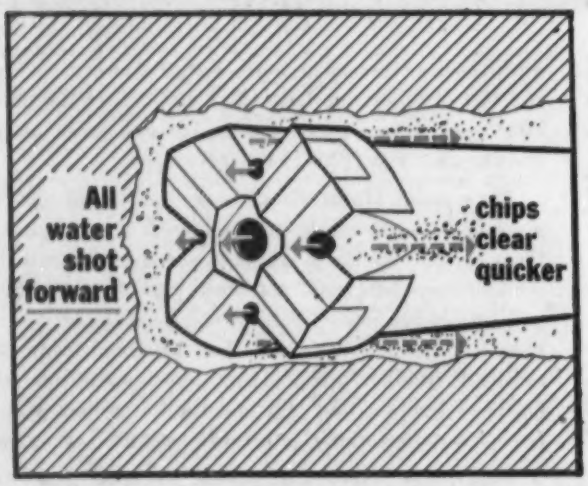
It's removable, remains secure, speeds chip



1 CHANGE BITS—SAVE STEEL, Simply remove the old bit, put the new one on the same drill steel. You don't have to lug heavy steels back to the shop for re-sharpening. And no need to throw away the steel when the bit is used up. You can drill out the full life of every steel . . . cut steel costs.



2 TAPERED SOCKET STAYS TIGHT. The new Timken® bit has a tapered socket that provides a more secure union than threads for air-leg drills. Its precision-made taper fits tight to the drill steel, reduces breakage, cuts expense. Gives you lowest cost per foot-of-hole.

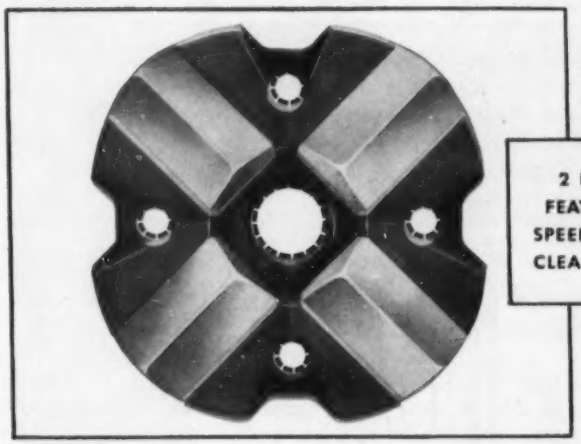


5 HOW CHIPS CLEAR FASTER. Here's how five front holes and the deeper, wider clearance, working together, clear chips faster—speed drilling—lengthen bit life. New, special analysis carbide inserts give cutting face superior wear resistance. Write today for free brochure. The Timken Roller Bearing Company, Canton 6, Ohio. Cable: "TIMROSCO".

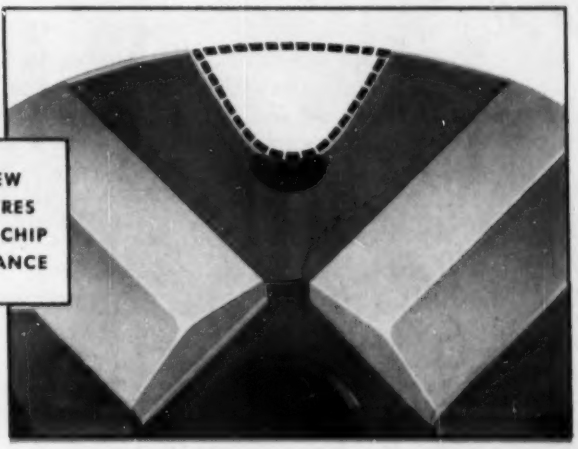
NEW TIMKEN THREADED BIT FOR OTHER TOUGH DRILLING JOBS. These new design features speed chip removal. 1) five front holes; 2) deeper, wider clearance; 3) deeper undercut under the heel. New wear-resistant carbides add life. Improved thread contact reduces breakage. You get lower cost per foot-of-hole.

socket bit FOR AIR-LEG DRILLS AND LIGHT STOPING

removal—gives lower cost per foot-of-hole

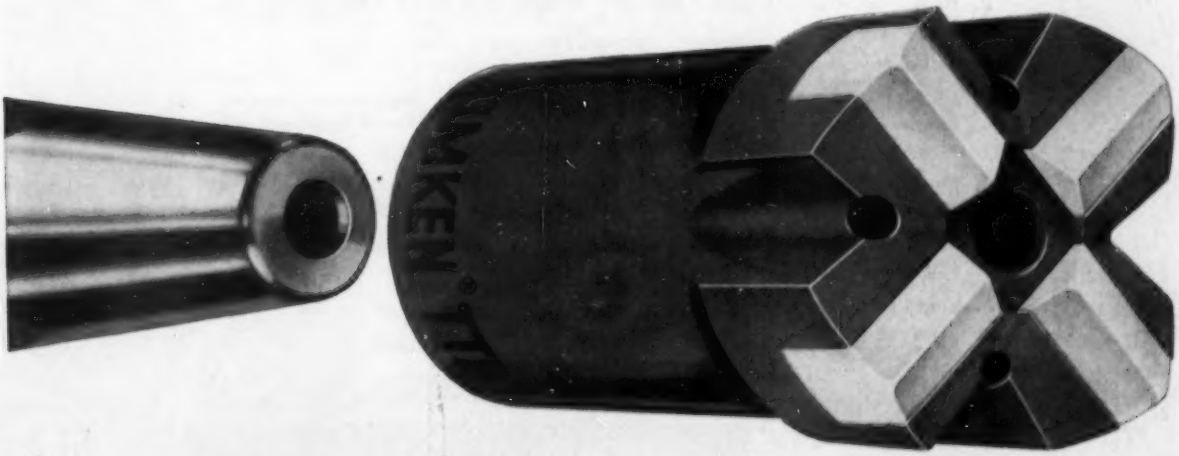


2 NEW FEATURES SPEED CHIP CLEARANCE



3 FIVE FRONT HOLES. New frontal design has five front holes that shoot the water streams directly in front of the bit—wash away chips faster. Bit spends more time drilling new rock, less time "drilling" chips. Larger center hole, with plug dropped deeper for freer cutting action, means less drag on the bit.

4 DEEPER, WIDER CLEARANCE. Extra deep, wider clearance between cutting wings permits water to carry chips faster from the cutting face of the bit. This faster chip flow speeds drilling and helps increase cutting efficiency. See diagram at left, below.



TIMKEN *REMOVABLE ROCK BITS*

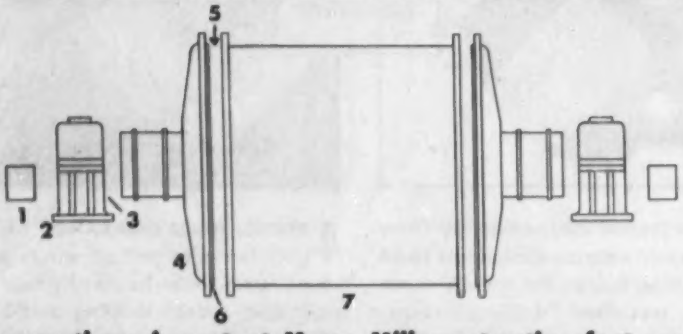
TRADE-MARK REG. U. S. PAT. OFF.

Your best bet for the best bit for every job...threaded carbide insert, multi-use, tapered carbide insert

how **MARCY EXPERIENCE**

gives you maximum operating economy

For more than 40 years Mine and Smelter has specialized in the design and manufacture of grinding mills. This **experience** has resulted in a selection of materials and a type of construction which offer (1) a quality and weight of materials assuring long, trouble-free operating service, (2) a type of construction which results in minimum maintenance (if one part of the sectionalized mill is damaged there is minimum expense in replacing it), and (3) a type of design which gives maximum convenience in installing, aligning and operating the mill.



Compare these important Marcy Mill construction features . . .

1. Removable, special bronze alloy bushing will not scour, is easy to replace.
2. Heavy bearing sole plates dampen vibration and shock load to concrete foundation.
3. Self-aligning ball and socket trunnion bearings.
4. Meehanite Metal heads . . . Meehanite's uniform density, high tensile strength, fatigue strength, rigidity and impact strength provide qualities of toughness and resilience.
5. Heads are separate from shell . . . if a trunnion is damaged you do not have to replace entire mill. Trunnions can be furnished separate from heads.
6. Male and female fits on flanges take shear off of bolts and assure proper alignment.
7. Heavy plate steel shell.

Gears have cut teeth, are split and reversible.

WRITE FOR CATALOG . . .

The Mine & Smelter Supply Co.

DENVER • SALT LAKE CITY • EL PASO • NEW YORK

Representatives in Foreign Countries

Electric-powered shovel loads Tournapull Rear-Dump with blasted rock at quarry. Loaded unit travels uphill grades of 6 to 16% in haul to crushing plant.

Spain

harnesses water-power with new Salto de Saucelle Dam

Speedy, maneuverable Tournapull Rear-Dumps work in narrow tunnels, haul up 16% grades

To provide more water power for the growing needs of Spanish homes and industry, Iberduero, S.A., a private power concern, is building a series of hydro-electric dams on the Duero River bordering Portugal.

Four such dams, at Esla, Villalcampo, Castro, and San Roman, are now in operation. Latest to be completed is the hydro-electric station at Salto de Saucelle, 85 km. (52 mi.) west of Salamanca. It has a capacity of 698 million kilowatt hours per year. Larger projects are now under study.

Need short-turning unit for work in tunnels

Iberduero bought four 46.6 kph (29.5 mph) D Tournapull Rear-Dumps for construction of water-feed tunnels early in the Salto de Saucelle project. Company engineers specified a heavy-duty haul-unit which could drive into narrow tunnels, turn around inside for loading, and haul out. Model D Tournapull Rear-Dump was the only large-capacity (11-ton) hauling unit which could meet this requirement. Machine makes 180° turn in less than own length, loaded—in only 75% of length, jack-knifed in dump position.

Building fill on Aldea Davila road, one of Iberduero's Tournapull haulers dumps, while another starts back down the curving mountain road to the quarry.

At Salto de Saucelle, these four Tournapull Rear-Dumps also were used later, along with a fleet of ten other haulers, to carry broken granite from open-pit quarry to crushing plant on a 7 km. (4.3 mi.) cycle. Some of the loads of quarry rock were routed to a site of a new road, a distance of 5½ km. (3.4 mi.).

5 m³ loads hauled up 16% grades

Each "D" loaded an average of 5 m³ (6.5 yd³) per trip, worked "around the clock" 6 days per week, except for brief maintenance checks. Average grades were 7% adverse, with some inclines as steep as 16%.

Plan larger dams

Four larger dams for Spain are in the study stage; one of them, Aldea Davila, will have a capacity of 1582 million kilowatt hours per year.

This chain of hydro-electric stations has already brought low-cost electricity to Madrid and many towns which were formerly served by more expensive diesel or Thermo-electric plants. Many villages, which have no electricity at all, will benefit from future units.

If your projects involve large-scale movement of heavy materials, Le-Tourneau-Westinghouse Tournapull haul units and scrapers will give you long-term, heavy-duty service. Ask us for additional facts on their performance on your type of jobs.

Tournapull—Trademark Reg. U.S. Pat. Off. DR-1052-D-tb

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

The Production Division of the Carpco Group

Carpco

MANUFACTURING, INC.

Carpco manufactures over sixty models of separation and accessory equipment all designed to offer complete interchangeability of parts for integrated plant design.

Industrial and laboratory model high tension and magnetic separators in continuous production.

Quality control is assured by complete manufacture.

Carpco materials handling equipment provides plant integration.

From the smallest detail to completely packaged plants — it's Carpco *all over the world!*

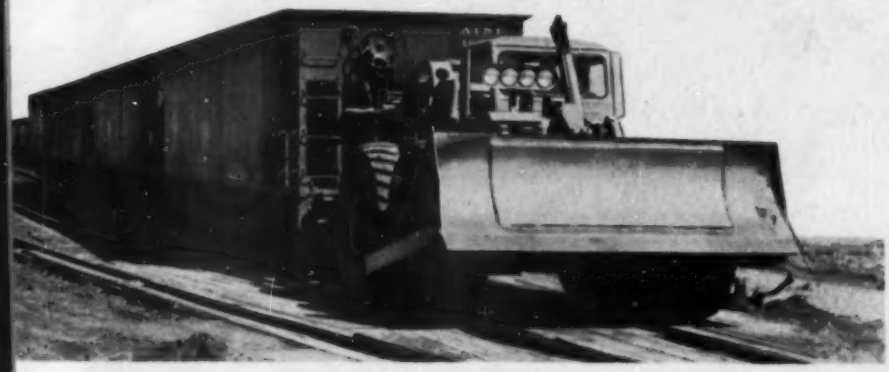
Carpco

CARPCO RESEARCH AND ENGINEERING * CARPCO MANUFACTURING, INC.
CARPCO CONSTRUCTION CORPORATION * CARPCO EXPORT CORPORATION
JACKSONVILLE, FLORIDA, U S. A.

At desert uranium plant

versatile SwitchTractor

shunts ore cars, dozes, cleans-up



Amos Leach, right, general crusher foreman, points out sturdy construction of SwitchTractor coupler, left, to Operator Marion Roberts. Rubber-tired switcher pushes 18 empty ore cars, pulls 5 loaded cars up 1% grade.

Big 208 hp SwitchTractor moves strings of ore cars to siding at Anaconda uranium mill. Low-pressure tires won't damage tracks, ties, or switches. SwitchTractor takes most direct route to any job, isn't tied to tracks.

Here's the story how The Anaconda Company solved a problem of rail traffic handling — together with pit and plant clean-up — at its uranium works in New Mexico. Anaconda needed switching service for ore cars at both terminals of a 35 mi. rail-line connecting a mine near Laguna with a processing plant close to Grants. Both locations are in the desert west of Albuquerque.

A survey of probable switch-yard activity showed that car-shunting and spotting would be an intermittent job. If standard switch-engines or specialized rubber-tired switching vehicles were used, they would be idle much of the day. While these machines "mark time", costs mount.

Wanted: dual-purpose machine

The metals firm decided it needed a dual-purpose machine — a coupler-equipped tractor. One with the "beef" to push or pull strings of ore cars . . . to doze, and haul equipment wherever needed around pit and plant. It wanted a fast, mobile rig — one able to speed from one job to another at short notice.

Double-duty SwitchTractor handles switching, dozing

Anaconda solved the problem with two versatile LeTourneau-Westinghouse SwitchTractors — one for each work center. Both at mine and mill, rigs met all job requirements.

At the Grants mill, Anaconda's SwitchTractor spots ore cars in the plant yard, keeps stockpiles in shape, cleans-up debris, hauls and pushes other mobile equipment. A. J. Fitch, manager of the New Mexico operations, had this to say about SwitchTractor's mill work:

"Moves 1,000,000 lbs."

"The machine has proved to our satisfaction that it can move a train of 1 million gross pounds up a 1 per cent grade. Riding over rails and switches proved no handicap."

In terms of cars, this means that SwitchTractor moves 18 empty or 5 loaded carriers up the incline.

Amos Leach, general crusher foreman, put it this way: "This tractor is very handy. It gets around nicely . . . both on and over railroad tracks, ties, and switches."

On 3 special jobs

"Around the plant," he added, "it speeds clean-up work after construction jobs . . . also loosens up stockpiles of packed ore, making them easier to handle. It pushes other heavy machines on cold mornings, too, to get them started."

SwitchTractor can solve the car handling problem on *your* sidings too . . . save you money doubling as a heavy-duty, clean-up tool around pit and mill. Let us give you complete details on this go-anywhere, dual-purpose tractor.

If you already own a Tournatractor, it can be easily converted for car-switching work, simply by the addition of a car-coupler at the rear. Write or phone for details.

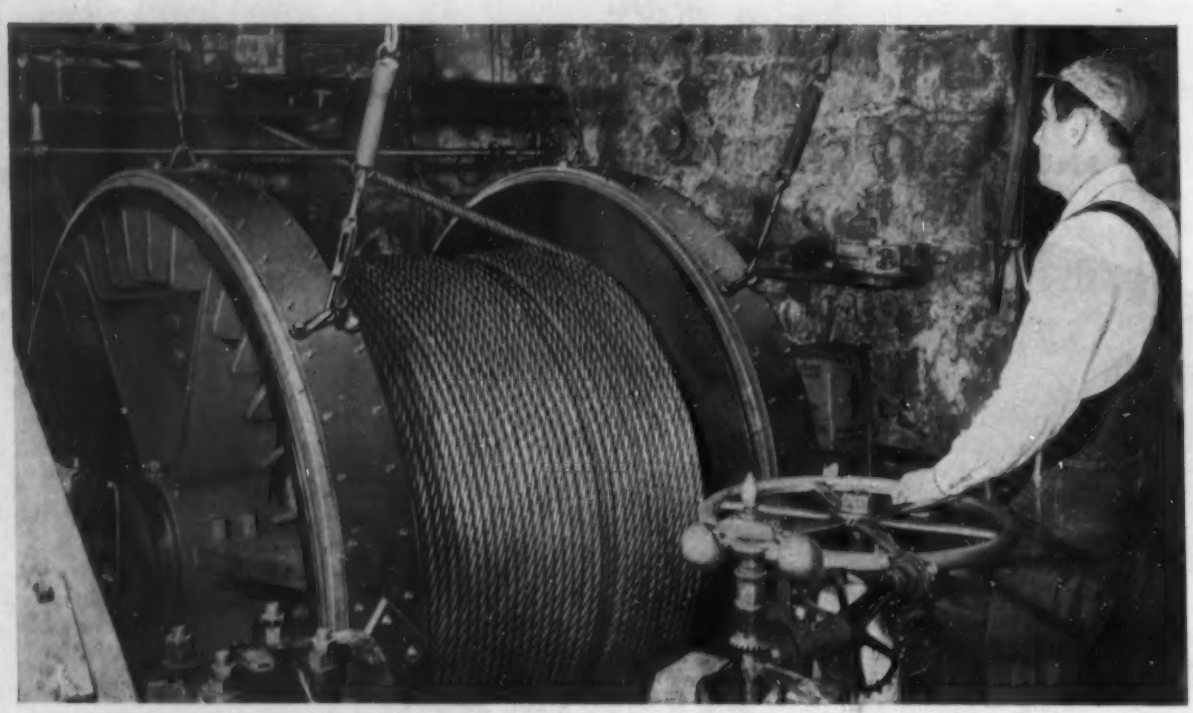
Rubber-tired tractor does all the work of a switch engine — yet costs much less to buy and operate. When not switching, rig keeps working as dozer at pit, plant or yard.

SwitchTractor—Trademark; Tournatractor—Trademark Reg. U.S. Pat. Off. ST-1072-M-b

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company



Another hoistman says . . .

"Tiger Brand spools best . . . doesn't fight"

George Marinos, hoistman at Utah's Royal Coal Co.'s Mine, says, "Tiger Brand Wire Rope doesn't twist and fight on the drum." And when wire rope makes this kind of friend—you know the rope has earned the compliment. Such men are only impressed by performance. George has had 2,200 feet of Tiger Brand rope on for the past twenty months. And it's been twenty months of continual stress and scrubbing for the rope. Yet this USS wire rope is still in top shape and promises many more months of dependable service.

1⅜" Tiger Brand brings up another 25-ton load. This haulageway pitches down a steep 34% grade and whips around such sharp curves that switchbacks are required. The Royal Mine has been working 2 shifts for about 24 months —that's about 406,000 tons of coal this Tiger Brand line has already hauled. The hoistmen say its tough, fatigue-resisting wires and spooling qualities make it ideal for haulage work.

For all mining work—depend on Tiger Brand Wire Rope to give longer, more reliable service. And when you want to talk with a specialist on mining rope application—call in a Tiger Brand Field Engineer for expert advice. Do this by contacting your local distributor or write Columbia-Geneva Steel, 120 Montgomey St., San Francisco

USS TIGER BRAND Wire Rope

United States Steel Corporation • Columbia-Geneva Steel Division

UNITED STATES STEEL

Moving fast, this 550 Adams grader keeps pit floor clean, saving wear on fleets' tires and treads. Permits driving equipment by shortest routes, improves drainage.

This high-speed modern grader keeps haul-roads in first-class condition to speed movement of production haulers, reduce wear on tires and machines.

Cut mining costs thru better clean-up

There are only two ways to increase your mining profits without a rise in the price of ore. You must increase production, or lower costs. . . or both.

You may think of your grader simply as a maintenance tool. But in the hands of a good operator, a versatile, modern high-speed grader increases mining production and cuts operating costs. Check these 9 big ways increased grader capacity can increase your profits.

Occasional spill over sides of heaped trucks . . . around hoppers, grizzlies, conveyors, and trestles. . . can litter concentrating plant area, slow traffic, damage tires. This Adams grader keeps this area clean by daily clean-up.

1. ***Regular and more frequent maintenance of haul roads*** — smooth roads speed hauling, save tire-wear, cut mechanical maintenance, improve safety.

2. ***Quick clean-up after blast***—grader provides a fast, inexpensive way to move scattered fragments back against toe, thus protecting men, machinery, and tires working around pit, speeding up all pit operations.

3. ***Clean pit floors*** — regular routine of maintaining wide traffic ways that make all areas of pit quickly accessible pays off. Equipment can travel to any assignment by shortest route. Smooth access saves wear on tires and crawlers, improves drainage, prevent dirt and refuse from weathering into levels of ore below floor.

4. ***Maintain good housekeeping around plant***—you need ample grader capacity to keep roads, runways, working areas around plant neat, clean, and workable at all times. Level or remove the occasional spill left by heaped trucks. . . from around hoppers, grizzlies, conveyors, trestles. Clean plant area speeds all mobile equipment operation around plant, reduces dust, improves safety.

5. ***Keep stockpile toes pushed in*** — weather and loading operations result in spread of toes around stockpile. This limits working space, wastes stored material. Also, working thinly-spread toes means inferior ore grades, increases loading cost. Regular grader service helps prevent this waste.

6. ***Keep dumps smoothly spread and level*** — regular grader service can spread dumped material clear over edge. Offset blade reaches far beyond leaning front wheels which hold against side thrust. A smooth, level, dry dump speeds hauling and dumping, cuts equipment costs. Grader can smooth haul road coming and going.

7. ***Clean ore benches of washed-down dirt*** — every rain washes dirt into upper benches, lowers ore grade. Prompt grader service halts "wash", provides planned drainage, piles washed-in material for easy removal by scraper or truck.

8. ***Assist exploration teams*** — a modern grader can build a well-graded and drained roadway in a matter of hours, speeds exploration work by maintaining good haul roads.

9. ***Keeps drainage open*** — in a few hours work per week, a modern grader will keep ditches clean, pit dry.

Inventory capacity of your present graders

It will pay you to inventory the work capacity of your present graders. If they are more than a few years old, you will probably find a substantial saving in replacement with the faster, more powerful, big capacity graders currently on the market. We will be glad to assist by furnishing specifications and comparative statistics on our line of modern Adams graders.

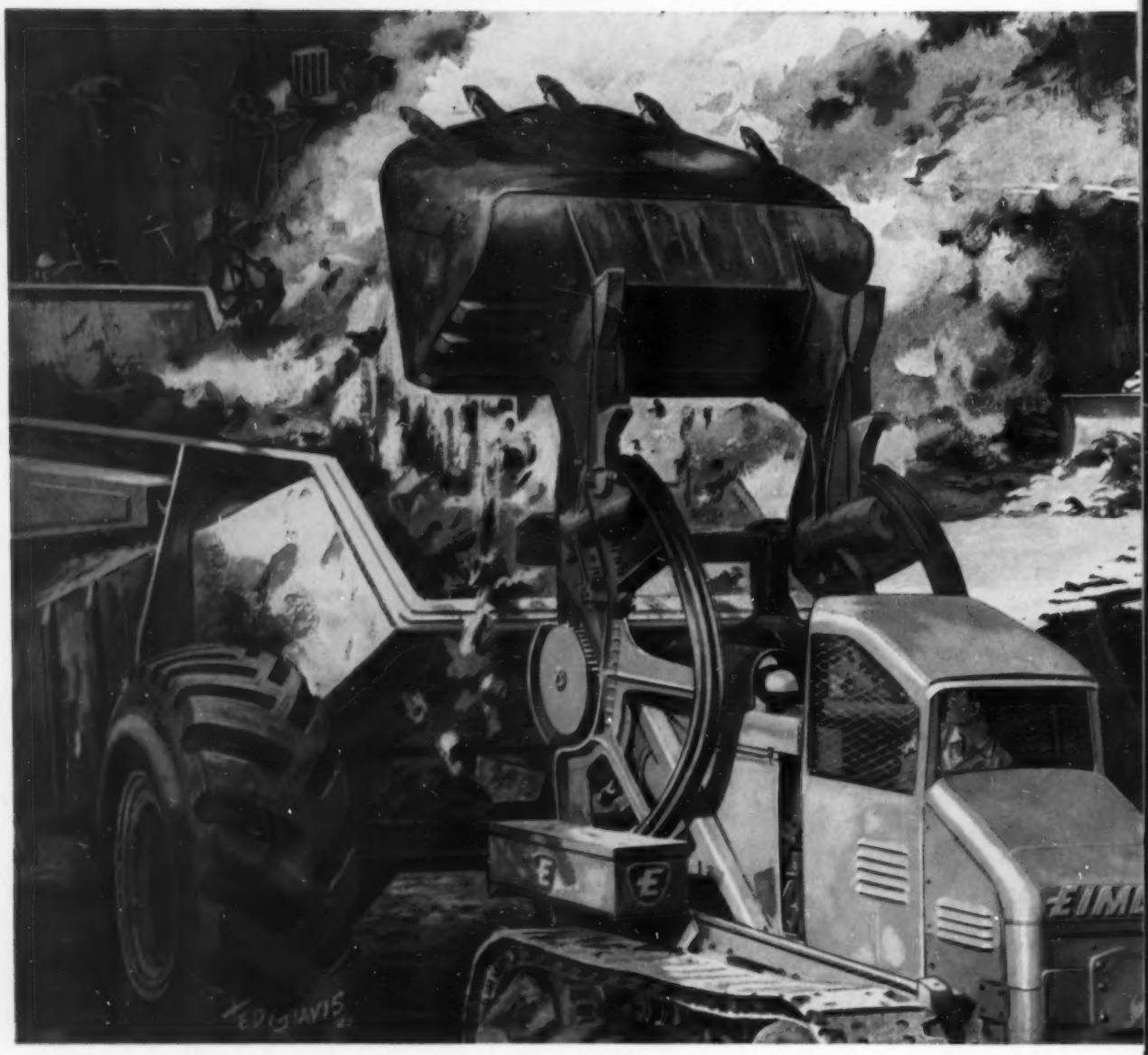
Reprints available on request.

AG-34-M-b

LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

What is the best



It's GM . . . America's First Choice Diesel . . . and here's why:

Best Diesel for mining—or any other job, for that matter—is the one that does the most work at the lowest cost, above or below ground.

That's why General Motors Detroit Diesel engines today handle more different mining jobs than any other Diesel.

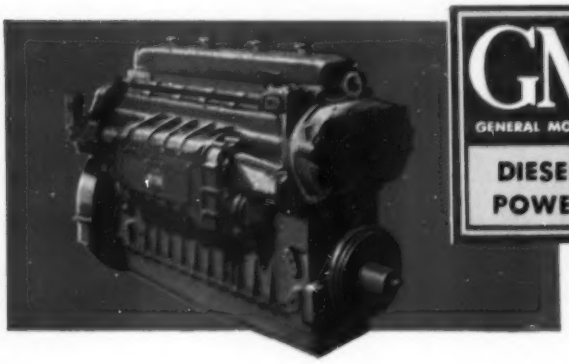
These compact, clean-running 2-cycle engines drive loaders, air compressors, draglines, locomotives, pumps, shovels and the most powerful trucks and tractors. GM Diesels are available in more than 1000 different applications of power machinery for every job from 30 H.P. up.

And with the recent addition of Turbopower engines to the line, increased horsepower with greater efficiency is now available in the same size engine. These new Turbopower Diesels develop up to 17% more power on no more fuel —or the same power with a 15% saving in fuel.

Next time you order new equipment—or repower old—be sure to specify GM Diesel. It's America's FIRST CHOICE Diesel *because it does more work at less cost!*

Diesel for Mining?

Equipment shown above includes: Eimco tractor-loader; LeTourneau-Westinghouse Tournatractor and Rear Dump; Lima Paymaster shovel; Gardner-Denver air compressors. Write for list of over 1000 GM Detroit Diesel power applications.



GM
GENERAL MOTORS
DIESEL POWER

DETROIT DIESEL

Engine Division of General Motors

Detroit 28, Michigan
In Canada: General Motors Diesel Limited, London, Ontario

Single Engines... 30 to 300 H.P. *Multiple Units... Up to 893 H.P.*

America's Largest Builder of Diesel Engines

These Lima Type 1201 draglines are shown excavating for an irrigation canal near Reynosa, Mexico. Out in the field—far from repair facilities—continuous, trouble-free operation keeps jobs like this moving rapidly for greater profit.

LIMA . . . built to stay on the job, prevent costly downtime

All over the world, thousands of Limas are proving in daily operation that they're built to *stay on the job*. On every type of digging and building job, these rugged machines provide continuous, trouble-free operation under the most grueling conditions.

Every Lima is designed and built with the emphasis on quality to insure constant peak performance with minimum downtime. Piston-type dirt seal rings and retainers in crawler rollers . . . flame or induction hardened moving parts . . . anti-friction bearings at all important bearing points including the drums . . . these are just a few of the extras built into every Lima to boost performance, reduce wear, and prevent costly field breakdowns. The pay-off is less downtime on jobs located far from parts sources and where skilled maintenance mechanics are not available.

Whatever your operation: building highways, railways, bridges, airports, dams or irrigation systems; erecting industrial, commercial or public buildings; digging coal, clay, stone or other minerals . . . there's a Lima engineered to meet your needs. The complete Lima line makes available shovels from $\frac{1}{2}$ to 6 yards, cranes with capacities up to 110 tons and draglines of variable capacities. Smaller capacities available on rubber.

In principal cities around the world, experienced distributors with qualified service organizations are ready to supply your construction equipment needs. Write us today for the name of your nearest distributor.

Madsen Model 481 Asphalt Plant

Baldwin-Lima-Hamilton Corporation Construction Equipment Division also manufactures Austin-Western Crushing, Washing and Screening Plants at its Lima, Ohio plant . . . and Madsen Asphalt Mixing Plants and equipment at its La Mirada, California, plant.

LIMA SHOVELS · CRANES · DRAGLINES · PULLSHOVELS

BALDWIN-LIMA-HAMILTON

Construction Equipment Division — LIMA WORKS

OTHER DIVISIONS: Austin-Western • Eddystone • Electronics & Instrumentation • Hamilton • Loewy-Hydropress • Madsen • Pelton • Standard Steel Works

Cable Address: LIMASHOVEL, Lima, Ohio, U.S.A.

Austin-Western 201-E Crushing Plant

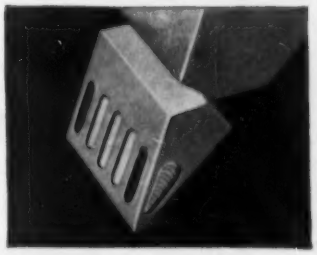
Amsco "WEAR-SHARP" Repointers outlast 2-part dipper teeth

One of the largest contractors on the St. Lawrence Seaway Project proved our point! He switched from two-part dipper teeth to Amsco® "WEAR-SHARP" Repointers, with grooves filled in by hardfacing.

Result: according to the contractor's own report, he's getting much better service life out of the tooth. And, in really rugged service, the teeth retain their cutting edge much longer . . . helping to maintain digging speed and conserve power.

Take a tip from this contractor's experience. Order Amsco "WEAR-SHARP" Repointers from your distributor—for longer service life, for better cutting action.

Hardface with Amsco Hardfacing Alloys and Welding Equipment, too!



"WEAR-SHARP" Repointers*

. . . have grooves on each end and on corner faces, which can be filled in with a tough hardfacing deposit. This equalizes wear and maintains a sharp cutting edge, prevents teeth from rounding or blunting. Available straight (as shown) or with crescent-shaped backs.

*Patented

Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

AMERICAN Brake Shoe COMPANY

AMSCO

American Manganese Steel Division • Chicago Heights, Ill.

OTHER PLANTS IN: DENVER, LOS ANGELES, NEW CASTLE, DELAWARE, OAKLAND, ST. LOUIS; JOLIETTE, QUEBEC

DOW

XANTHATES: collectors of consistent quality, in pellet form for dustfree handling. Wide range assures high selectivity.

LET THESE Recovery Chemicals

WHEN a mill's sulfide flotation costs are at rock bottom, chances are you'll find Dow Xanthates and Dowfroth® 250 at work in the recovery process. Carefully compounded for independent collecting and frothing, this pair functions in perfect balance to bring you the highest flotation efficiency known.

High selectivity

Dow offers a wide range of Xanthates that are substantially nonfrothing, completely and quickly soluble in water. They are designed for selective flotation to assure maximum loading of the froth as ore conditions change. In addition, these superior collectors assure an unusual ease in handling, for the entire series comes in pellet form. No dust, waste, or spillage problems!

Livelier froth

The ideal working partner to Dow Xanthates—or any other *collector*—is Dowfroth 250. It is completely water-soluble also, and produces a froth that's lively over a wide range of conditions. In many cases, Dowfroth 250 reduces frother consumption as much as 75%! Action is rapid and non-collecting, better accommodates ore variation. And froth is easy to launder, pump and thicken; does not deteriorate rubber parts.

Everyone benefits

Flotation experts agree that Dow Xanthates and Dowfroth 250 do much to improve recovery and concentrate grade. The metallurgist has better control of frother and collector. And the operator's work is pleasanter, thanks to the pellet form of Xanthates and the low volatility of Dowfroth 250. Why not write us for samples today and let every member of your flotation team discover the advantages of these dependable mining chemicals!

DOWFROTH 250 (shown in sample jar): a livelier frother that's noncollecting, easy to regulate. Often cuts consumption 75%!

PROVE THEIR EFFICIENCY TO YOUR WHOLE TEAM

Of course, technical assistance is always available, and oftentimes serves as a short cut in solving problems . . . in finding the answer to increased production per flotation dollar.

We would also be pleased to send a sample of Separan 2610®, the new high-speed flocculant that is doubling—even tripling—production in settling and filtration operations. As little as one pound settles 100 tons of solids! THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. OC 858N.

SEPARAN 2610—Amazing speed of new flocculant is setting economy records throughout the mining industry. One uranium processor, for instance, reports savings of nearly $3000 a day! Faster settling and increased filtration have eliminated four of his five thickeners, two banks of filters, and several earthen ponds.

you can depend on DOW CHEMICALS

DOW

TS-360

280 hp diesel engine
15 cu yd struck capacity
20 cu yd heaped capacity
4 forward speeds to 20.0 mph
reverse to 3.1 mph

TS-260

200 hp diesel engine
11 cu yd struck capacity
14 cu yd heaped capacity
4 forward speeds to 20.0 mph
reverse to 3.1 mph

Shown above is an Allis-Chalmers Model TS-360 motor scraper and an HD-21 tractor.

get all these earth-moving advantages with Allis-Chalmers Motor Scrapers

Allis-Chalmers TS-360 and TS-260 motor scrapers are designed to meet the mining industry's ever-increasing demands for machines that will produce more, do today's jobs better and faster than ever before. Here are just a few of the advantages they offer for big-volume, low-cost earth moving.

More Usable Horsepower. New Allis-Chalmers diesel engines with Tornado Turbulence and follow-through combustion deliver greater torque, smoother operation, more complete burning of fuel and longer life.

Extra Traction. These motor scrapers provide greater tractive effort when loading or traveling. Two-thirds of the *empty weight* is carried on the drive wheels. *Loaded weight* is distributed equally between tractor and scraper wheels for better balance, safer hauling.

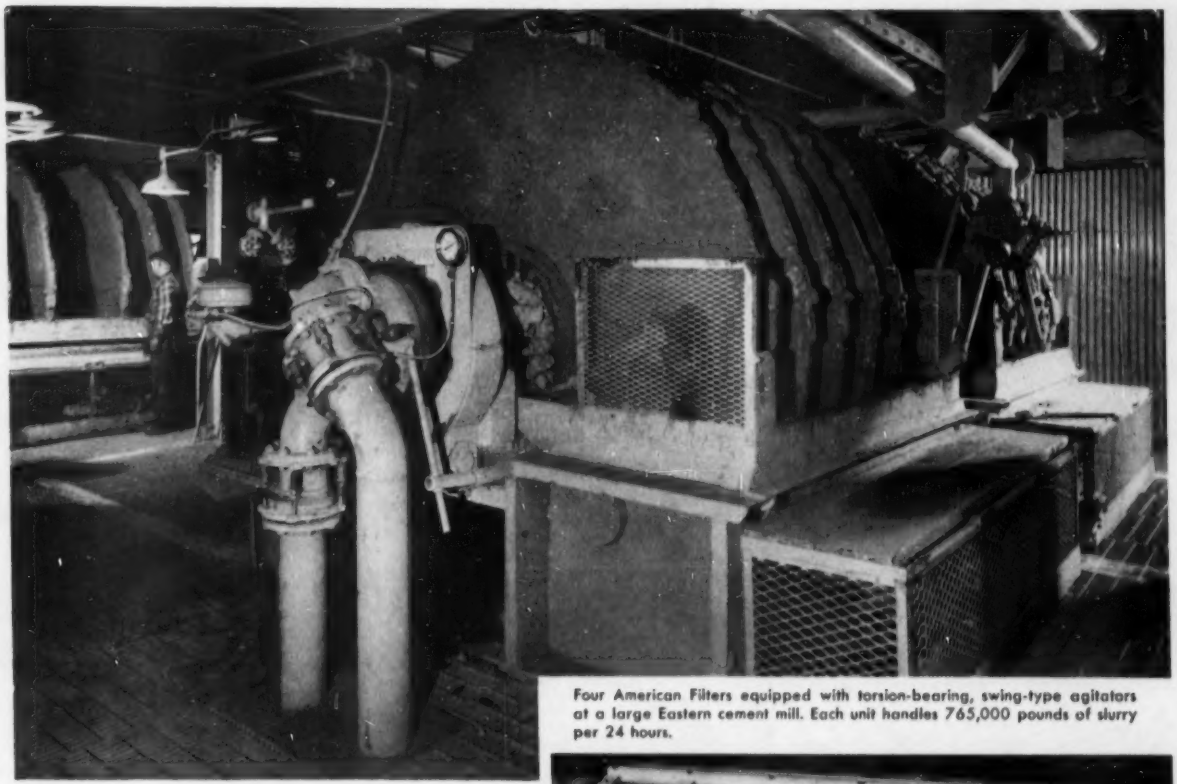
Positive Steering. Two-speed selective power steering provides safe, feather-touch response when traveling at high speeds, full maneuverability in cut or fill. Operator does not need to brake the wheels to steer; fast hydraulic action does the work for him.

Easy-Loading Bowl. Wide, low bowl design with curved bottom and offset cutting edge assures full-capacity loads in less time. Big apron opening — 102 inches on TS-360; 95 inches on TS-260 — speeds dumping of materials.

Visibility. Two-wheel tractor design increases operator vision, brings both ends of cutting edge into view. Result, more efficient loading and spreading, safer hauling.

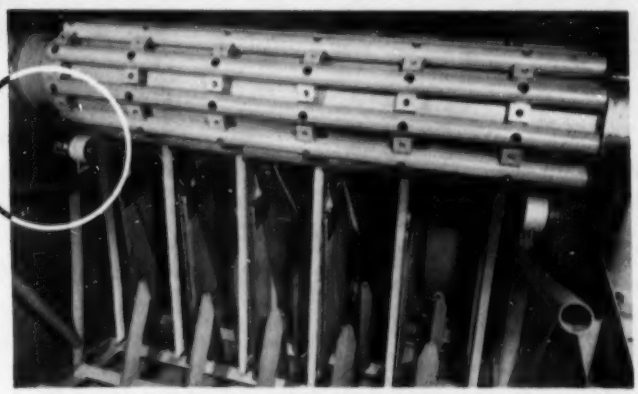
ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION
MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS



Four American Filters equipped with torsion-bearing, swing-type agitators at a large Eastern cement mill. Each unit handles 765,000 pounds of slurry per 24 hours.

New Swing-Type Agitator on AMERICAN FILTER...



Closeup of the new agitator installed in Filter Tank. Torsion bearings are at left and right just under the main shaft.

Latest development in continuous disc filters is a new swing-type agitator designed by Dorr-Oliver that completely eliminates troublesome stuffing boxes and assures uniform agitation from the bottom of the tank to the slurry surface. Here's how it works.

Vertical picket members are attached to the agitator. These pickets extend up between the filter discs and insure positive, uniform agitation throughout the feed slurry. Torsion bearings located on the inside of the tank walls support the agitator. These bearings incorporate a special rubber compound, bonded to the bearing support and agitator shaft, that flexes as the shaft oscillates. It is impossible for slurry to enter the bearing.

This new development is typical of Dorr-Oliver's continuing search for improved techniques in wet processing. If you'd like more information on the American Filter with the new swing-type agitator, just drop a line to Dorr-Oliver Incorporated, Stamford, Connecticut.

American T.M. Reg. U. S. Patent Office

DORR-OLIVER
INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U.S.A.

More Profitable Goldbricking at Benguet

with

Unique Slime Flotation Process

1—The combined 3000 tpd Dorr-set-Dalator mill in the rugged trascosr of the Baguio gold-mining field.

2—Ball mills and bowl classifiers in the cyanide circuit.

3—Tray thickeners in cyanide circuit thinning scumony froth associated with the primary slime of the ore.

AMERICAN CYANAMID COMPANY

MINERAL DRESSING DEPARTMENT

30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

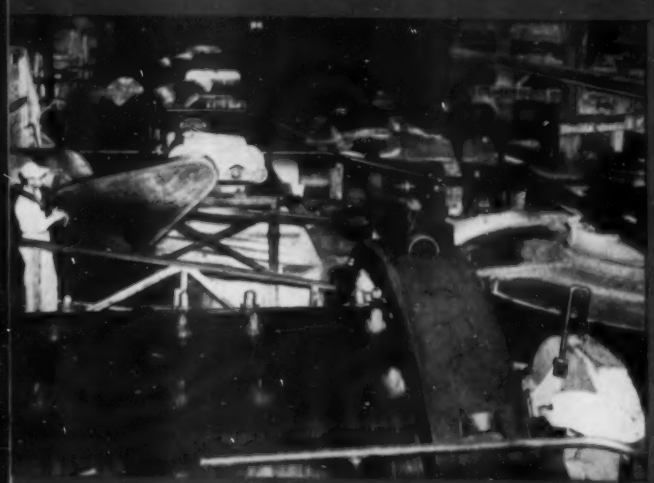
At the 3,000 ton-per-day Benguet-Balatoc mill of Benguet Consolidated Inc. in the Philippines, primary slimes resulting from gouge material in the vein system amount to 13% of the tonnage milled. Extremely fine and gelatinous, these slimes are difficult to thicken and almost impossible to filter because they form a very thin, impervious filter cake.

In spite of these extraordinary difficulties, Benguet's novel procedures now recover 79% of the gold in these slimes. After sand-slime separation in spiral classifiers, the slime is passed through a 24" DorrClone at the rate of about 250 tons per day. The underflow goes to cyanidation with the sands, and the overflow to flotation.

Feed to flotation contains about 2.25% of the total values in the original ore and averages 12% to 14% solids. Reagents used include AERO® Xanthate 301 at 0.033 lb. per ton and AERO® Xanthate 350 at 0.046 lb. per ton, with pine oil and soda ash to scalp out a concentrate running over $9.00 per ton. Flotation concentrates are fed to the cyanidation circuit for leaching with AERO® Brand Cyanide.

Prior to use of DorrClones in the slime circuit, 5.5% of the total tonnage milled was treated by flotation. With the addition of the 24" DorrClone, approximately 8.5% of the total tonnage milled now goes to flotation. The present method improves precipitation, filtration of final residues is easier and soluble loss is reduced. Fewer pumps are required. There is a marked effect on settling in both primary and secondary thickener circuits, allowing two 50-foot balanced tray thickeners to be withdrawn from the cyanidation circuit. And flotation reagent consumption is slightly less.

Important to the Philippine economy, the post-war resurgence of the Benguet operation has been remarkable. Two independent mills at Balatoc and Benguet were almost completely destroyed during the invasion and liberation of the Philippines in 1941-45. Ingeniously and painstakingly the



mill was rebuilt at Balatoc with salvaged bits and pieces and operations were resumed until new equipment arrived. The Balatoc mill handles ore from both mines, with Benguet ore travelling through a 13,000-foot tunnel.

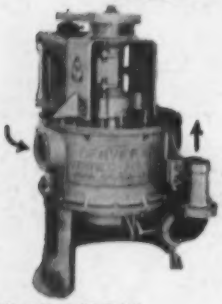
Cyanamid engineers have been privileged to work with the Benguet staff for many years. Cyanamid has supplied Benguet and Balatoc with its products for over 25 years. A Cyanamid engineer will be glad to share with you his sound operating and metallurgical knowledge. A letter or phone call will bring you prompt service.

CYANAMID

DENVER CAN SUPPLY COMPLETE EQUIPMENT FOR YOUR MILL

One Responsibility

Crushers, Screens, Feeders, Ball-Rod Mills, Classifiers, Jigs, Pumps, Samplers, Agitators, Conditioners, Flotation, Thickeners, Filters, Dryers, Ore Testing and Mill Design Services.



DENVER VERTICAL CENTRIFUGAL SAND PUMP . . . for use where

1. Feed is intermittent.
2. Pulp is frothy or air laden.
3. Feed varies in density.
4. Floor space is limited.
5. Plant portability is an advantage.
6. Long life is a factor.
7. Initial cost must be minimum.
8. Feed sump is impractical.

Sizes from ¾" to 4". Also Denver Adjustable Stroke Diaphragm Pumps from 2" to 8", simplex and multiple units.

For complete information, WRITE FOR BULLETIN NO. P10-B5.

How DENVER SRL (Soft Rubber Lined) PUMPS CAN CUT YOUR PUMPING COSTS...for abrasive pulps or tailings

1. POWER COSTS CUT

Denver SRL Pumps often use less than one-half the brake horsepower required by other pumps in similar service. This is the result of simplified design and high efficiency of molded rubber parts. **This means substantial savings for you in power costs and maintenance.**

2. SHUTDOWN TIME REDUCED

Because molded rubber parts are highly resistant to corrosion and abrasion, case history records show where Denver SRL parts lasted up to 15 times longer than parts on pumps previously on the same service. This means increased production, savings for you in maintenance costs—and, more important, reduced down time.

3. A PUMP FOR EVERY JOB

Denver SRL Rubber Lined Pumps are available to you for standard or heavy duty service and with capacities up to 2400 g.p.m. You can choose exactly the right pump that will do your pumping job most efficiently, most economically. Parts for all sizes are kept in stock for fast service.

If you have abrasive or corrosive material to pump, you can make substantial savings by using Denver SRL Rubber Lined Pumps. For complete information about what Denver SRL pumps can do for you, **WRITE TODAY FOR FREE BULLETIN P9-B8. MOST SIZES OF SRL PUMPS IN DENVER STOCK.**

"The firm that makes its friends happier, healthier and wealthier"

DECO ENGINEERED — DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

DENVER EQUIPMENT CO.

1400 Seventeenth St. • Denver 17, Colorado

DENVER • NEW YORK • CHICAGO • VANCOUVER • TORONTO

MEXICO, D. F. • LONDON • JOHANNESBURG

Mining World

THE IMPORTANT MINING MAGAZINE EVERYWHERE

October 1956

INTERNATIONAL PANORAMA

HENDERSON, NEVADA—Titanium Metals Corporation is expanding titainum production facilities here at a total cost of $15,000,000. Sponge refining facilities are to be raised from 16.7 to 25 daily tons, and ingot facilities from 17 to 30 daily tons.

TOKYO, JAPAN—A joint mining company is to be established by the Mitsubishi Mining Company, the Mitsubishi Trading Company, and the Perulex Company of Peru to develop the Inicia Tiva iron ore mine in Peru.

ALBANY, OREGON—The Wah Chang Corporation has taken over the Bureau of Mines zirconium facilities and will produce about 300,000 pounds of sponge per year.

COPENHAGEN, DENMARK—Members of a Danish expedition to Greenland have reported discovery of rich lead deposits about 50 kilometers from the present operations at Mestersvig.

BATHURST, NEW BRUNSWICK—The Anaconda Company (Canada) Ltd. is diamond drilling a major base metal property 30 miles west of Bathurst.

LA PAZ, BOLIVIA—The Bolivian Cabinet has approved the reorganization report covering the Corporacion Minera de Bolivia which currently operates the country's nationalized mines.

NEW DELHI, INDIA—India plans to increase her current annual aluminum output of 7,500 tons to 40,000 tons annually by the addition of two smelting plants.

PITTSBURGH, PENNSYLVANIA—Koppers Company Inc. and Kennecott Copper Corporation will submit a joint proposal to the AEC for construction of a uranium feed plant with an annual capacity of up to 5,000 tons of uranium salts.

VANCOUVER, BRITISH COLUMBIA—Climax Molybdenum Company has taken an option on a 103 claim molybdenum property in the Caribo district. A prospecting syndicate optioned the property.

CHICAGO, ILLINOIS—Fansteel Metallurgical Corporation plans to build a $6,000,000 plant for production of columbium and tantalum, increasing present tantalum capacity by 50 percent and columbium capacity by 150 percent.

NEW YORK, NEW YORK—Olin Mathieson Chemical Corporation and Revere Copper and Brass Inc. have formed a jointly owned $231,000,000 company to produce 180,000 tons of primary aluminum annually. New firm is called Olin Revere Metals Corporation.

WASHINGTON, D. C.—The Office of Defense Mobilization has granted the DMEA an additional $6,000,000 borrowing authority to finance essential projects during 1957.

NEWARK, NEW JERSEY—New Jersey Zinc Company's mine at Ogdensburg has reopened after settlement of a strike which lasted one year.

POINT COMFORT, TEXAS—Aluminum Company of America will add a seventh potline to its aluminum facilities at Point Comfort, thereby increasing capacity by another 20,000 tons. The new line should go into operation January 1, 1958.

TOKYO, JAPAN—It is reported that Kobe Steel Works, Nippon Mining Company, and Toho Titanium Company are planning to form a joint company to produce zirconium.

MOAB, UTAH—Atlas Corporation's uranium subsidiary, Hidden Splendor Mining Company, is acquiring a 30 percent interest in the new uranium mill under construction by Uranium Reduction Company.

CLEVELAND, OHIO—Horizons, Inc. has started work for the United States Bureau of Naval Aeronautics on a $200,000 contract to commercially produce electrolytic titanium at less cost than by the Kroll process.

Annual U_3O_8 Output Nears 30,000 Tons in Free World

Production of uranium ore and concentrates from all free-world sources continued to increase during the first half of 1956. Upon completion of projects now underway, or definitely planned, production of free-world uranium oxide (U_3O_8) should exceed 30,000 tons per year.

During the first half of 1956, the Shinkolobwe mine in the Belgian Congo continued as an important producer of uranium without significant change in the rate of production. South African production again increased over the previous 6-month period, and will continue to grow as new plants are completed. A total of 17 uranium processing plants have been authorized in South Africa of which 14 are in operation. Low-grade mechanical concentrates produced at Radium Hill in South Australia continued to be treated at the Port Pirie chemical treatment plant at a normal rate. Rum Jungle operations in the Northern Territory of Australia are producing uranium concentrates as expected. Portugal operations for the past six months continued at the normal rate.

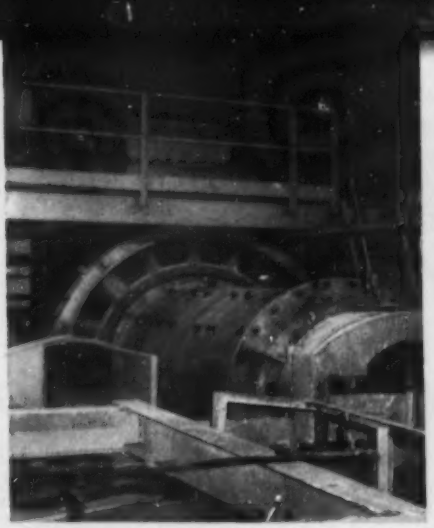
Except for its Canadian contracts, the United States has undertaken its foreign procurement jointly with the United Kingdom. The Combined Development Agency (CDA) was established in 1944 as one of the United States-United Kingdom-Canada operations of wartime atomic development. CDA's principal function is to develop and procure uranium supplies. Since Canada is a uranium producer with limited requirements, it does not participate in the combined procurement program, and its uranium has been sold to the United States under direct Commission contracts. The CDA at present has production contracts with Belgium, the Union of South Africa, Australia, and Portugal.

Anaconda Subsidiary Drills Canadian Property

The Anaconda Company (Canada) Ltd. have five diamond drills in operation on a large base metal property in New Brunswick, Canada, some 30 miles west of Bathurst. Two zones of massive sulphides have been outlined, each over 1,000 feet in length, with width varying from 15 feet up to 115 feet. The deposit contains copper-lead-zinc-silver ore.

This firm is a wholly owned subsidiary of The Anaconda Company of Butte, Montana, formed to examine and develop mining properties in Canada. This year its name was changed from Frontenac Exploration and Development Company. Work in the Bathurst area is under the direction of Dr. C. G. Cheriton who has established an office at Bathurst.

In November – How Goodnews Bay Maintains Platinum Output



ROD MILL GRINDING circuit in new Marcy mills. Grind is in water to grain size minus-325-mesh). Mill discharge is over a

BLUEWATER EXPANSION is best shown by this aerial picture. The light colored buildings are original carbonate mill as of June 1954. The dark buildings represent additions and expansions for acid mill.

CONTROLLED AGITATION LEACHING neoprene-lined steel tanks. Manganese di- ing agent is fed into the top of the first eight

How Anaconda Recovers U_3O_8 From

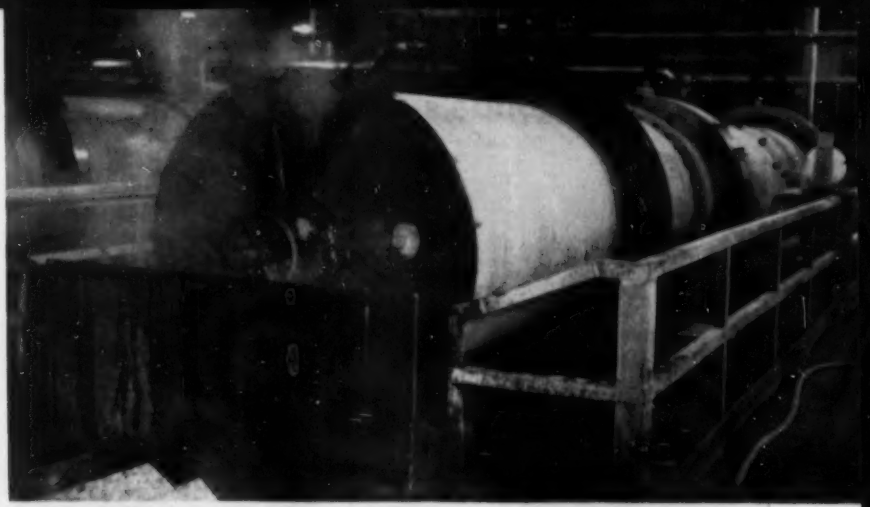
By GEORGE O. ARGALL, JR.
Editor

The Anaconda Company moved rapidly ahead on many fronts during the past year. Geographically, these fronts extended from Columbia Falls, Montana to La Africana, Chile. Metallurgically, they extended from aluminum to zinc. Anaconda added aluminum to the 18 metals and minerals it produces and sells; shortened its name to the "Anaconda Company"; and elected a new president—Clyde E. Weed—in this period.

Anaconda did many things in many places but the fastest moving front was in uranium—at the New Mexico operations centering at Bluewater. Here are a few of the accomplishments that have made Anaconda one of the world's leading uranium ore mining and milling companies: Built a five-mile-long standard gauge railroad from the Jackpile mine to the main line of the Atchison Topeka and Santa Fe Railway Company; built 172 houses in three separate towns—Jackpile, Grants, Millsite; stripped millions of tons of overburden from the Jackpile orebody; built a new ore crushing and car loading plant at the mine; and increased daily production of Jackpile ore so that all acid mill requirements could be met from this mine.

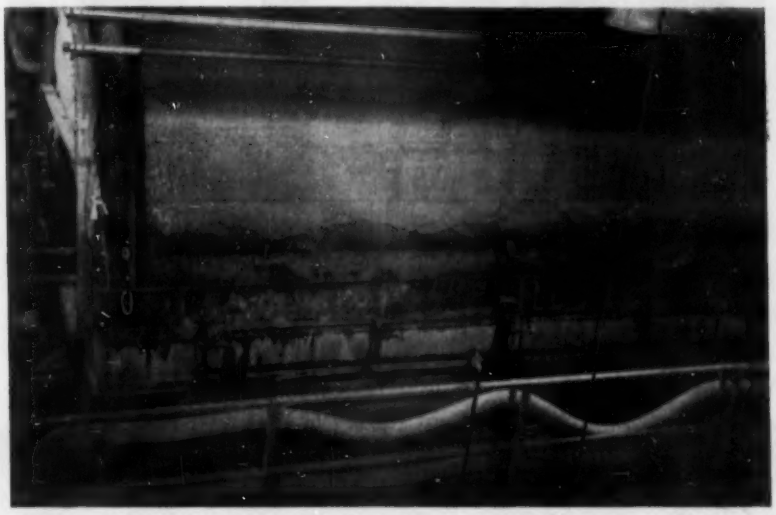
At the Bluewater mill, a pilot plant acid-leach sandstone circuit was built and placed in operation for training supervisory personnel in September 1955. The first of two, identical, full-scale sandstone circuits was placed in operation on December 5, 1955, and the second quickly followed on January 5, 1956. The existing carbonate leach circuit was also expanded. To support the enlarged leaching circuit and new sandstone mill units, a new railroad car unloading dump was built; the crushing plant was increased by addition of new and larger equipment; a nominal 75-ton-per-day, contact-type, sulphuric acid plant was built; employee recreational facilities constructed; and the office warehouses, machine-carpenter-electric shops enlarged.

sandstone mill incorporates two parallel (15 to 20 percent plus-48-mesh, 38 percent vibrating tramp screen with ¼-inch cloth.



BURT FILTERS in the carbonate mill. These filters were in the original flowsheet for limestone ores. Today they are used on a mixed limestone-sandstone feed. Burts are batch operated and are used successfully for difficult filtering ores.

of rod mill overflow is done in this series of oxide, minus 300-mesh, which is an oxidiz- tanks with these dry type Denver feeders.



GOOD THICK DRY CAKE breaking loose from one of the three, Dorr-Oliver, 11.5- by 18-foot filters in the enlarged carbonate mill circuit. They operate in series. Separan 2610 added to the pulp to filters has accelerated filtering.

Sandstone Ore At Bluewater Mill

John B. Knaebel, manager of New Mexico operations, who directed the uranium expansion to completion ahead of schedule, was promoted on July 1, 1956 to the position of assistant to Richard S. Newlin, vice president in charge of mining operations, with headquarters in New York, New York. Albert J. Fitch, Jr., who had been assistant New Mexico manager, was advanced to the position of manager.

The importance of efficient mill operation is well recognized by the company and E. C. Peterson, who has had many years of experience at Anaconda mills, has been advanced from general mill superintendent to assistant manager.

These are the highlights of the uranium operations since MINING WORLD's first reports in August and September 1954 covering the first carbonate leach milling circuit, and discovery and initial development of the Jackpile and Woodrow mines.

This article covers the enlarged Bluewater mill. The greatly expanded and accelerated mining operations will be described in a future issue.

Fortunately, for both the public and the mining industry, the United States Atomic Energy Commission has lifted most of its curtain of secrecy about uranium metallurgy. Therefore, details of the Resin In Pulp (RIP) circuit at Bluewater using ion exchange, together with inside-the-mill photographs, can now be published through the cooperation and courtesy of Anaconda.

During the last several years, rapid advances have been achieved in the art of uranium metallurgy. The first thing to consider in reporting on the Bluewater mill is how these new developments have been applied to treatment of Jackpile ore.

Metallurgical Process

Dale Matthews, chief metallurgist, outlines the sandstone ore acid leach metallurgy and flowsheet as follows:

Ore is crushed, sampled, stored in bins, and then drawn, at predetermined rate, from several bins to secure the desired blended feed. Grinding is

Anaconda's Uranium Team

J. B. Knaebel

A. J. Fitch, Jr.

E. C. Peterson

D. Matthews

W. J. Roberts

T. M. Fitch

in a neutral solution to minus-10-mesh to facilitate mechanical handling of the pulp. For Jackpile sandstone ore, sulfuric acid is used to leach the silica-grain cementing material, which, of course, includes uranium minerals.

Manganese dioxide is used to oxidize the pseudo primary minerals. To all appearances and by formula the minerals appear to be primary. But, metallurgical testing has shown them apparently to be reduced secondary minerals, which, in the presence of carbonaceous material including liquid phase hydrocarbons, apparently form the pseudo primary minerals in this environment. Oxidants must be added to the leach because of the presence of metallic iron and carbonaceous matter, both of which form a strong reducing environment.

Acid addition is controlled so that a uranyl sulfate with uranium in a plus-six valance is achieved by proper oxidation.

Next, a mechanical sand-slime separation is made. The slime fraction is diluted only by washing. The leached sand, with 25 percent water, is discarded at tailing. A 99 percent plus washing efficiency is sought. Uranium-rich slime pulp is sent to the ion exchange circuit. Jackpile ore is different from many other Plateau ores in that sulfate concentration for the ion exchange is low. This is partially due to the fact that it is one of the lowest acid consuming ores. This results in fewer sulfates. Accordingly, the slime portion is neutralized with soda ash, Na_2CO_3, which does not reduce the sulfate ion concentration. In addition to maintaining this sulfate concentration, a pH is established which is conductive for ion exchange. At the same time the EMF is brought to the desired point. A proper EMF is obtained by reducing with ferrous sulfate. EMF governs the valance of vanadium which must be kept in a reduced state.

Now the slime pulp is ready for ion exchange using strong base resins, round beads which are minus-16-mesh, plus-20-mesh in size. In ion exchange, the uranyl sulfates radicals are loaded onto these beads in a series bank scheme (tanks) where there are 10 loading and four elution banks. The feed bank is loaded to predetermined capacity, that is, loaded to equilibrium of feed solution, or, the in and out solutions are in equilibrium. Then the bank is taken off the feed stream.

The bank is then dumped and the pregnant pulp sent back to feed. Resin is water washed and the eluting solution is added, which strips off the sulfate (uranium) ions and adds nitrates to recharge the resins. This now forms the unclarified pregnant eluate. The least loaded resin in a bank series gets the strongest ammonium nitrate solution. In elution, the nitrate ion concentration decreases as the sulfate concentration increases.

Milk of lime is added to this pregnant eluate solution to precipitate gypsum, $CaSO_4$, which is then filtered off and returned to leach. The clarified pregnant eluate from which sulfates and gangue slimes have been filtered is treated with magnesium oxide to form a complex ammonium magnesium diuranate precipitate. A filter press separates the yellow cake precipitate from barren filtrate. Ammonium nitrate and sulfuric acid are added to the barren filtrate to reform the eluting solution. Yellow cake is dried and drummed for shipment.

Anaconda is the only known uranium mill in the United States using two-stage precipitation—first, gypsum, second magnesium ammonium diuranate. Experience has also proved that the gypsum which is formed is the cheapest source of filtering aid.

In summation: Ion exchange is really a refining or purifying method. On Plateau uranium ores the sulfuric acid leach forces use of ion exchange because sulfuric acid is not selective. By acid leaching, in addition to the uranium, vanadium, zirconium, and molybdenum are dissolved as sulfates. Therefore, the RIP process is used at the Bluewater acid-leach mill because it is impractical to obtain a clear uranium-rich solution from the sand-slime separation in contrast to South African practice where a clear, sharp separation is possible by filtration. This is, of course, not feasible for Jackpile ore because of its clay gouge, mudstone, bentonite, etc. content.

Basically, this is the process. Sounds simple, doesn't it? It may sound simple, and it is simple metallurgically in contrast to earlier uranium concentration methods, but it is most complex mechanically and operationally.

Why Mill is Complex and Costly

Hundreds of chemical determinations must be made each day, many each hour, for every main step in the process. Many costly reagents are used; some in large quantities.

Mechanical complexity can best be appreciated by these facts: There are over 10 miles of pipelines in the mill, mostly neoprene-lined. There are over 20 miles of electrical conduit. There are hundreds and hundreds of valves of many sizes and types—again, nearly all neoprene-lined or stainless steel. There are over 300 pumps in the mill. All pump sumps have a stand-by pump. Over 500 electric motors are used. There are 114 large tanks, again most are neoprene-lined.

Mechanical complexity is emphasized by the fact that the plant con-

tains equipment never used or even thought of before, any place in the world.

The flow sheet for the acid-leach mill was worked out by Anaconda metallurgists under the direction of F. F. Frick. All of the design work for the mill was done "on the job" at Bluewater under the direction of C. E. Chaffin, by special arrangement with the Galigher Company. All construction contracts, construction supervision, and mechanical details were handled by the Anaconda staff. This paid off in that, by forced schedules with adequate construction labor, the mill was completed at such an early date.

Proof of capable design and construction has been actual plant operation. Within a few days after start-up, the plant was operating satisfactorily at greater than designed capacity. Only a few minor mechanical changes have been necessary since.

Special drives were engineered for the ion exchange baskets. Alternate baskets are driven by opposing sprockets from one line-shaft with 10 baskets in each bank.

The electric circuits: Main load distribution centers are used, with controls for most motors in such centers. Individual start-stop switches are provided at each separate piece of equipment in the mill.

Acid resistant brick is used extensively in the plant: under the clarifying filter presses, under the concentrated acid tanks, and under the pilot plant.

Today, Four Mill Circuits

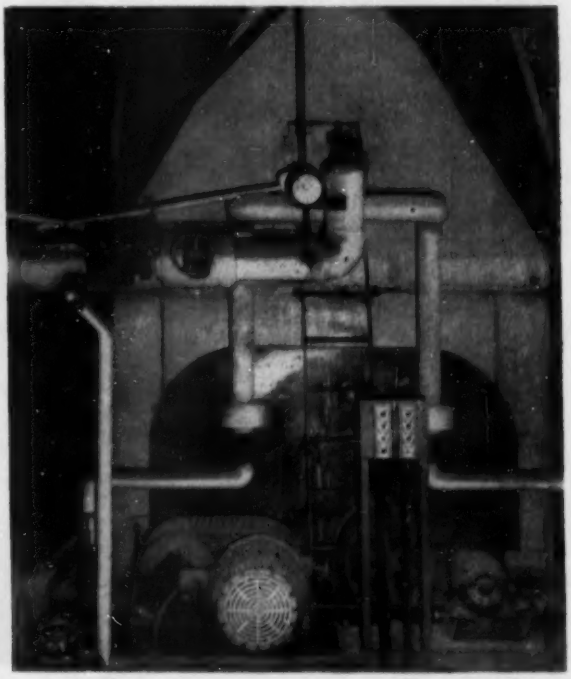
Bluewater mill expansion outlined in the earlier article has been completed. Today the mill is actually four mills; that is, four milling circuits with two crushing circuits. The acid plant has two parallel twin circuits; the carbonate plant has two circuits essentially identical except that the original retains Burt filtering and the newer has Oliver drum filtering. Also, primary ores are now treated in the carbonate circuit. This interdependence of circuits extends right through to the tailing pond which receives pulp through four separate pipe lines. Thus the mill has maximum flexibility which facilitates repairs on any piece of equipment in any circuit.

From mine to RIP, the entire operation is geared to one control—control of grade, amount of slime-forming minerals, moisture, and carbonaceous matter (logs, trash, asphalt-like hydrocarbons, and oil). There are many ways used to blend ore to maintain a uniform mill feed so that the plant with its many time cycles and reagent additive rates operates as nearly as possible as a continuously uniform rate.

Jackpile ore is delivered to the mill in 70- and 80-ton, bottom-drop-door, railroad gondolas. Cars are weighed and then spotted on top of the dumping station by a SwitchTractor. Cars can be spotted over any of four dumping pockets so that ore of similar grades and characteristics can be blended. A Hewitt-Robbins car shake-out empties the cars in three minutes. A Michigan front-end loader, operating on the concrete floored dumping pockets, picks up ore dumped from the cars and transports it to the grizzly which has 2-foot-square openings. A Galigher belt feeder draws ore from the grizzly pocket to the No. 1 belt which carries it to a 24- by 36-inch Cedar Rapids jaw crusher. Scissor conveyors elevate crushed ore under a tramp iron removing magnet to a double-deck, 5- by 8-foot, Tyrock vibrating screen. Undersize is conveyed to and drops through a sampling tower. Oversize drops through chutes to a 30- by 30-inch, double-impellor, Cedar Rapids impact breaker. Discharge drops to main conveyor for recirculation.

The carbonate-leach ore, mined from Anaconda's own limestone mines and purchased under contract from Santa Fe Railroad's Operation Haystack, and other limestone mines, is delivered by truck to the original crushing and sampling plant. Some Jackpile sandstone ore received by rail is also milled by the carbonate process. However, this original or No. 1 crushing plant has been enlarged and a Cedar Rapids impact

PUMPS are key mill components at Bluewater. Pictured here are a series of Vacseal pumps in the sand-slime separation section. Note standby pump for each pumping circuit.



URANIUM PRECIPITATE is dried on this rotary steam-drum drier. The precipitate is splashed in a thin layer on outside of heated rotary drum where it is quickly dried and scraped off.

breaker put in the circuit ahead of the Symons crusher. By a system of transfer belts, both crushing circuits have great flexibility of operation. Either plant can crush either type of ore and deliver it to any of the feed bins. This circuit flexibility assures desired blending, and also permits repairs to any component section without shutting down the entire plant.

After crushing and sampling, ore to be acid-leached is stored in five, 500-ton, manganese steel lined mill bins. The bins are enclosed in an insulated steel building. Natural gas space heaters inside the building prevent ore freezing during winter. Ore is drawn off the bottom of the bins to two main belt conveyors which deliver it over Weightometers to rod mill grinding circuits. These belts run parallel to and on each side of the row of bins. A reversible crossbelt under each of the conical-bottom bins feeds the main belts. This permits close blending to the two grinding circuits. Normal procedure is for two bins to feed one belt, another two the other belt, with blending from fifth bin to either belt.

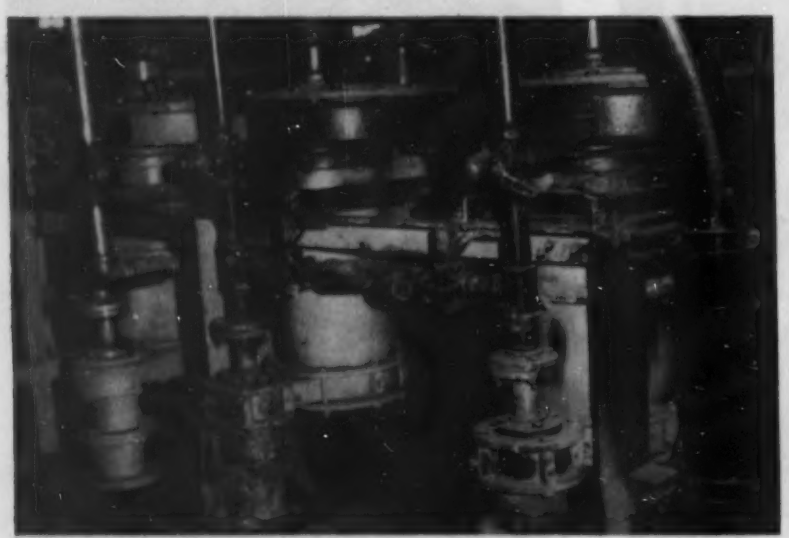
Grind in Water

Blended feed, all minus-½-inch, is fed to Marcy rod mills, using only a 9-ton rod charge. Grind is in water to grain size (15 to 20 percent plus-48-mesh, 38 percent minus-325-mesh). Mill discharges over a vibrating tramp screen, with ¼-inch cloth. Oversize is reground. The circuit is arranged so that the pulp from the screen sumps may be pumped through cyclones with plus-14-mesh material returned for grinding. This cyclone circuit is only used occasionally; normally, the pulp from the screen sump is pumped by a 6-inch, Vacseal, rubber-lined pump to the leach tanks. Rod mill overflow density is 70 percent. This is slightly diluted by screen wash water to 60 percent before leaching.

Controlled Agitation Leach

Leaching is done in a series of 13- by 14-foot, neoprene-lined steel, agitation tanks. Neoprene-covered, ship-type propellers are used for agitation. Sulphuric acid is stage fed to the first eight leach tanks. Acid is controlled and checked for each tank. Manganese dioxide, minus-300-mesh, is dry-fed into the tops of the first eight leach tanks with Denver Equipment feeders. Piping is arranged so that flow from any tank to another can be controlled, or cut off, as desired. Ten-inch tank risers prevent shortcircuiting of flow. Agitation and leach time is about 14 hours, with the final discharge having a pH between 1.1 and 1.2. Pulp density at discharge is 60 percent solids. This is reduced with water to 35 percent for classification. The pH and EMF are carefully controlled by the leach section operators. Solution control readings are made with a Beckman pH meter equipped with platinum electrodes.

Of necessity, from the first leach tank through the yellow cake precipitation tanks or to the tailing pumps, all pipe lines, pumps, tanks, and machinery are made acid proof by neoprene lining or use of stainless steel.



THREE CYCLONES, 10-inch two-cycle Equipment Engineers units, make the final sand slime separation. The uranium-rich cyclone overflow, all minus-325-mesh, is pumped to RIP storage tanks.

The sand slime separation of the leached pulp is made by classifiers and cyclones: mechanical classifiers to separate out the sand fraction, and cyclones to insure that the uranium-rich pulp is all minus-325-mesh.

The leached pulp is pumped to two 5-foot by 23-foot 4-inch Dorr classifiers set on a 2-inch-per-foot slope and operating in parallel. Number three, four and five, classifiers operate in series treating sand overflow from one and two. Overflow from one and two are joined and are pumped to six 6-inch Dorrclones. Cyclone overflow gravitates to a vibrating chip screen (see below). Underflow is pumped to three 10-inch two-cycle Krebs (Equipment Engineers) cyclones. Krebs cyclone overflow is pumped to RIP storage tanks. The sands from classifiers number three to five are advanced with the wash water going back toward the feed end. The overflow from each classifier is pumped first to Dorr cyclones. For example, washed sand from number four goes to number five with the number five overflow going to cyclones and then to the number three classifier.

The vibrating chip screen is most important. Here all wood chips, stray rubber, pieces of rope, paper, etc., are completely eliminated from the pulp. Screen cloth is Carpenter 20 stainless steel made into Tyler Ton Cap No. 147 with 8 by 28 mesh openings (0.013 by 0.097 inch). Wire diameters are 0.023 and 0.028 inch. Chip screen cloth is exactly the same as that in the baskets in the ion exchange banks. It is most essential that no blinding of the basket screen takes place.

Combine Tailing

The sand tailing from number five classifier flows to a sump. Barren solution from the ion exchange banks (see below) is also tailing and is pumped to the same sump as the sand tailing.

The two tailings form acid plant tailing which is pumped twice with 6-inch Vacseal pumps—first, through 8-inch, rubber-lined steel, and second, through 12-inch wood stave pipe to the tailing disposal area northwest of mill. All tailing lines are laid in duplicate. Because of its high nitrate content, the clear water which rises to the surface of the pond cannot be reused in the mill. Tailing discharged to the pond has almost a neutral pH, a specific gravity of 1.122, and is 17.33 percent solids.

IXL Building

Uranium rich or pregnant solution (six-percent solids) from the Krebs

cyclones is pumped to the IXL (ion exchange) building where it is stored in one of three, 20-foot, RIP make-up solution tanks. One tank is always supplying feed to ion exchange, a second is being adjusted for feed, and the third is being filled. To the adjusting tank Na_2CO_3 is added to bring the pH to 1.6 to 1.8. Occasionally H_2SO_4 must be added to obtain this pH. Powdered ferrous sulphate is added to adjust the EMF.

RIP Banks

The adjusted pregnant solution pulp is pumped to a series of RIP banks or machines. At Bluewater there are two parallel circuits, each with 14 banks in each of which 10 baskets operate.

The four colored picture on the cover of this issue of MINING WORLD shows the interior of the ion exchange building. The picture was taken by Anaconda's photographer and used in the company's 1955 Annual Report. Anaconda generously furnished the color plates for use on the cover.

Banks are arranged for a cascading gravity flow of solution from one to the other. These banks are steel tanks lined with neoprene in which stainless steel screen baskets (each is a 4-foot cube) are alternately raised and lowered slowly through the pulp. As explained above, the size of the screen cloth permits easy flow of solution, but is of a size which also prevents passage and loss of the resin beads from basket into bank.

The vertical oscillating movement of the baskets creates a pumping action which exposes the entire surface of the bead to the solution and prevents packing and cementing of the beads. Each basket is loaded with a predetermined weight of beads. Actually only about the bottom 12 inches of the basket is filled.

Ten banks are on the uranium loading (uranium adsorption) or solution exhaustion cycle at one time.

When beads have become loaded to capacity with uranium (sulphates) ions, the bank is taken off the loading cycle and the next bank in down stream series receives pregnant feed. Also added as the tenth bank in series is the bank just taken off elution (see below). The loaded bank is given a water wash to flush off any slime. Wash solution is returned as classifier make-up. The pulp from the bank in the loading series is RIP tailing and is pumped to classifier sand tailing sump described above.

Next the loaded bank is added to the downstream end of the eluting, uranium stripping, or nitrate exchanging solution. This eluting solution

MICHIGAN front-end loader handles all Jackpile ore delivered to the Bluewater mill in railroad gondolas. The loader has picked up bucket of ore from Bin No. 1 and is dropping it on top of Grizzly ahead of crushing circuit.

contains 80 grams of NH_4NO_3 per liter and has a pH of 1.6. Elution takes place over a predetermined time based on grade solution, flow rate, and resin loading factor. The fresh eluting solution is pumped to the lowest loaded resin bank first and then advanced down stream through four banks. After residence for correct time the unclarified pregnant eluate is pumped to one of three 18- by 20-foot storage tanks.

Two-Stage Precipitation

When a tank has been filled, lime is added to a pH of about 3.5 which precipitates gypsum ($CaSO_4$) and a small amount of iron. The pulp from this tank is pumped to a plate and frame filter press where the precipitated sulphates and gangue slime are removed. The filtrate is now the clarified pregnant solution and is pumped to precipitation tanks. The precipitate (largely gypsum) is returned to leaching tank feed and the insoluble gypsum goes through the circuit to tailing in the classifier sand.

Magnesium oxide (calcined magnesite) is added to the clarified pregnant solution to a pH of 6.8 which precipitates out the magnesium ammonium diuranate (yellow cake). The pulp is filter-pressed to recover precipitate which is dried on a special steam-drum drier. The uranium precipitate is splashed on a rotary drum, the interior of which is heated. The thin layer of precipitate quickly dries on the heated metal surface and the dried cake is scraped off the drum as it rotates. Cake is drummed for shipment to the AEC at Grand Junction, Colorado.

Sulphuric acid and ammonium nitrate are added to the barren filtrate to bring it up to strength and then it is returned to eluate storage for recycling. Some solution bleed-off to tailing is necessary to maintain desired ion strength.

Enlarged Carbonate Mill

Capacity has been more than doubled at the carbonate leach mill. By the use of Separan 2610 filtering has been accelerated appreciably throughout the original circuit. A second 5½ by 12-foot Marcy rod mill in the grinding circuit and three 11½- by 18-foot Oliver drum filters have also been added to handle the increased tonnage.

Feed now is 60 percent sandstone ore and 40 percent limestone ore.

Leaching is on a continuous rather than batch basis, still under a 30-pound pressure at a temperature of 250° F. Increased leaching contact time has been provided by the addition of one more agitator making six in series. Discharge is to a surge tank with rotating arms to keep pulp from settling. From the surge tank pulp is pumped to one of the five Burt filters which, of course, still operate on a batch basis, or to the three Oliver filters usually operating in series.

Calcined brucite (MgO) is added to the pulp. It proves to be a filtering aid, gives clearer solutions, and depresses carbonaceous matter. Potassium permanganate ($KMnO_4$) is used as an oxidizing agent.

Continued on page 91 (WM 75)

Taconite Milestone: The Story of the Reserve Project

Aside from just being big, Reserve Mining Company's new taconite facilities represent a milestone in the progress of mining and metallurgical technology. From the mine at Babbitt on the eastern end of the Mesabi range to the beneficiating plant 47 miles away at Silver Bay on Lake Superior, Reserve echoes all the trials, the frustrations, the thousands of hours of testing, the new ideas and the discarded ideas, the endless planning, sweat, and sleepless nights which forged the success of the huge $190,000,000 Minnesota venture.

Words can't possibly do justice to the plant. You have to see it to believe it. Taconite is the mother of all the high-grade iron deposits of the famed Mesabi Range, and its existence has been known for years. It remained for the march of time which changed economic conditions; for the development of technical skills and treatment know-how; for the dwindling supplies of high-grade ore; and for the blast furnace operator's demand for better feed to make taconite feasible. Taconite pumps new life into the iron range.

Yes, the Reserve project is big. The ore body is nine miles long. Reserves are set at 1,500,000,000 tons today, and drilling may extend this estimate. Already a cut over 1½ miles long has been opened in ore. The E. W. Davis Works at Silver Bay will turn out 3,375,000 tons of 63.5 percent iron pellets annually. This means that over 10,000,000 tons of Babbitt ore will be gobbled each year.

Some of the hardest ore in the world is found at Babbitt. As the author says — "there is nothing tougher than taconite, except possibly an old miner." Jet piercing has proved most successful and Reserve has five rigs operating with penetration rates of 18 feet per hour. Large electric shovels with undersize buckets have made savings possible in maintenance costs. The mine crushing plant has a newly designed, rubber-covered, steel cable reinforced conveyor belt. The world's largest gyratory crusher, a 60-inch machine, was installed at the mine for coarse crushing.

The main building in the beneficiating plant at Silver Bay is over a quarter of a mile long. It even has a roadway along the upper level so that maintenance trucks can travel through. It takes 32 seven-foot shorthead crushers, 12 big rod mills, 24 ball mills, 96 cyclones, and 192 magnetic separators to concentrate the ore. In addition 18 balling drums, 18 coal coating drums, and 6 huge pelletizing machines go into making a hardened ⅝-inch pellet suitable for blast furnace feed.

Reserve built not one but two towns. The company constructed 4,300 feet of harbor breakwater, port facilities for Lake steamers, docks, bins, and boat loaders. The

lake bottom had to be dredged so that deep draft ore carriers could approach and tie up at the Silver Bay quay.

In 1939 the Reserve Mining Company entered the taconite picture. Far-seeing men of both Republic Steel Corporation and Armco Steel Corporation, joint owners of Reserve, knew of the tremendous amounts of taconite on the Mesabi Range, and knew this potential source of iron would have to supplement the fading reserves of high grade, direct shipping, iron ores. That they were correct in their thinking is now evidenced by the huge E. W. Davis taconite processing plant at Silver Bay, and the mine at Babbitt, Minnesota.

Reserve Mining Company let contracts for the construction of the E. W. Davis Works, 56 miles northeast of Duluth, in September, 1951. Also during that year, Reserve reequipped an old inactive taconite processing plant at Babbitt. The old plant was part of an attempt in the early 1920's, by a group led by the late D. C. Jackling, to process taconite. The attempt failed, as the group could not successfully compete with the then plentiful direct shipping iron ore of the northern Minnesota ranges.

Of prime importance to the creation of the Reserve plant, as well as to the rest of the taconite industry was a 1941 act by the Minnesota State Legislature. It is known today as the Taconite Tax Law. The law limited the amount of ad valorem or property tax that could be assessed against taconite land, mining, and processing facilities. Instead, a special production tax was levied, thus further encouraging the development of Minnesota taconite.

INTERIOR VIEW of typical crushing installation at E. W. Davis Works at Silver Bay shows four, 7-foot shorthead cone crushers on upper tier with four 6- by 12-foot double deck screens just below.

Research Started in 1942

Experimental work to determine the best method to process the magnetic taconite was started as early as 1942 by Reserve personnel, in collaboration with professor E. W. Davis (in whose honor the processing plant was named), director of Mines Experiment Station, University of Minnesota. Professor Davis has had long experience with taconite, being among the group that tried to make taconite a reality in the 1920's and beginning his first work with the stubborn rock in 1913. He retired from the University of Minnesota in 1955. During 1941 and 1942, professor Davis and his staff developed the pelletizing method of agglomeration. Six years later a series of successful tests were made with pellets in a small experimental blast furnace at the University of Minnesota. Experiments in 1949 were also conducted at a pilot plant at Armco's Ashland, Kentucky steel works to develop the agglomeration and heat treatment of taconite concentrates into pellets.

HENRY G. GRUNDSTEDT, manager of MINING WORLD's engineering services made a special trip, early in September, to Reserve Mining Company's taconite operations to obtain the photographs and information for this first full report on Reserve.

Deposit Nine Miles Long

Exploratory diamond drilling, started back as far as 1947, indicated that the Reserve deposit, located in the eastern end of the Mesabi Range, is about nine miles long, 2,800 feet wide, and approximately 175 feet deep at its thickest point. The wedge shaped deposit consists of finely disseminated particles of magnetite in chert, averaging between 25 to 30 percent iron.

Geology of the deposit is typical of the Mesabi Range. Taconite is found in the Biwabic iron formation, consisting of four layers of alternating slate and chert, lying on a bedrock of granite having a small layer of quartzite between it and the lower slatey member of the formation. Reserve taconite is being mined in the upper cherty member of the Biwabic. The gently dipping taconite body strikes south 59° west, and dips approximately 5½° to the southeast, although

TOUGH TACONITE is drilled with jet piercing units which have drilled a maximum footage of 30 feet per hour. Minimum hole diameter is 6¾ inches and bottom is chambered.

INTERIOR OF DRILL CAB shows Don Youngren at controls of jet piercing rig. Block shots are fired with holes spaced at 19-foot centers on a square pattern.

at the extreme east end of the mine a sharper dip of 28° is encountered. A layer of glacial drift covers most of the Biwabic formation; however, it is rather thin at the Reserve property, thus facilitating the stripping problem. Diamond drilling is being resumed to further delimit the ore deposit, now known to be in excess of 1,500,000,000 tons. With this known reserve, and a concentrating ratio of 3:1 (taconite to pellets), the deposit has the potential of producing over 500,000,000 long tons of high grade iron ore.

Developing the Pit

Stripping presents no great problem, due to the thin overburden and frequent outcropping of the taconite. Depth of overburden varies from zero to 30 feet. In most instances blasting is not required, and stripping is accomplished with four 2½-cubic yard power shovels, loading into 22-cubic yard end-dump Diesel trucks. Caterpillar tracked front-end loaders are used frequently for clean-up work. What little blasting has to be done is usually limited to the breaking-up of boulders with 60 percent dynamite plastered on the rock. Overburden is hauled a maximum distance of approximately 3,000 feet, just beyond the limits of the deposit. Operators are quite careful to strip cleanly down to the taconite to provide the best possible setup for the large jet piercing drills.

A large cut was started along the strike of the deposit. This cut is presently over 8,500 feet long, 500 feet wide, and 47 feet deep. Height of the benches will be limited by the depth of hole the jet piercing units can efficiently drill; the jet drills usually drill about 50 feet. The Babbitt pit eventually will be nine miles long, and over 2,800 feet wide. In order to keep the center of the pit clear, the mine is divided into a series of blocks extending into the ore at right angles to the center-line of the pit. Blocks are started every 1,200 feet on the left and right side of the initial cut. Mining blocks in such a manner provide extra faces for blasting, and will keep the center of the pit free from broken muck. Mining will be continued in a series of vertical cuts extending both downward and outward, until the limits of the deposit are reached. A second downward cut will be started this month to provide a maximum number of working faces for equipment.

Jets Drill 30 Feet per Hour

It was found, after much experimentation, that the only drills which could pierce the super-hard Reserve taconite fast, and economically, while still maintaining the desired hole diameter were the jet piercing drills. With the utilization of these unique drills, speeds up to 30 feet per hour were not uncommon, although the mine average is 18 feet per hour. In contrast to this, early work with churn drills realized speeds as low as one foot per hour which at times required four bit changes for this foot of hole alone.

Old miners on the Range state that there is nothing tougher than taconite —except, perhaps, old miners.

Engineers at Babbitt have found that better fragmentation results when the bottom four feet of the 6¾-inch

minimum diameter drill hole is chambered. That is, the diameter of the last four feet is roughly twice that of the rest of the hole, allowing more powder to be placed in the bottom of the hole.

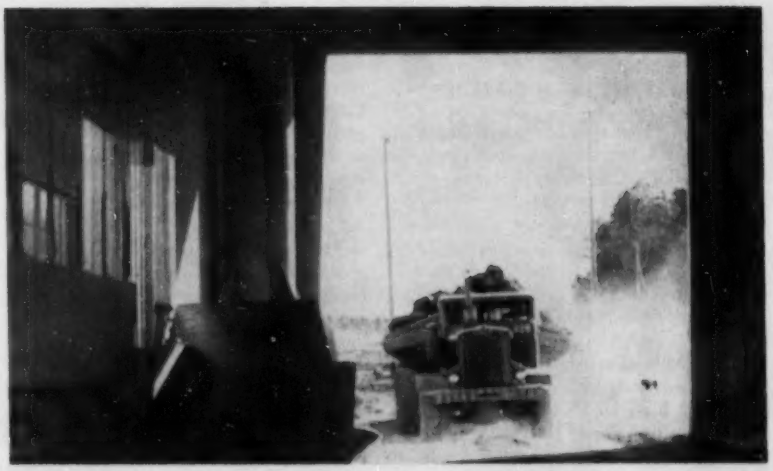
Jet holes are drilled in a square pattern, spaced about 19 feet apart. A block about 200 feet wide by 300 feet long is drilled before any blasting is done. The blast holes are detonated with primacord, which is connected to the holes in such a way that the overall pattern appears to be herringbone in design, that is a series of parallel V's approximately 13 feet apart. Timing of the blast is accomplished with a series of millisecond delays, and placed so the first V goes off first, and so on.

Secondary Blasting Cut Down

A rather unique system which Reserve engineers are still working on is one which will, as much as possible, eliminate secondary blasting. They have found that the taconite has a tendency to break in large slabs which involved a large amount of secondary blasting. Chambering the bottom of the hole helped considerably, but this still was not enough. Recently much progress has been made by drilling a series of small diameter satellite holes around the main jet hole. Approximately five or six smaller holes drilled with a percussion drill are drilled six feet deep, and set off at the same time the main hole is detonated. Satellite holes are drilled with an automatic machine attached to a self-contained tractor and compressor. This unit has proven highly successful for this type of work. Thus far, excellent fragmentation is being realized with the use of the satellite holes.

Desensitized powder, both gelatin and ammonium nitrate types are used in blasting. The powder is lowered into the hole in six-inch diameter cans or cartridges. Also used in the main jet holes and in the satellite holes are small pellets of almost pure TNT. Pellets are used primarily to fill the chamber at the bottom of the drill hole, filling in the space around the bottom powder cartridge. Usually a 50-foot hole will pull about 47 feet. Powder consumption is approximately 0.49 pound per ton. To date the largest blast at Babbitt produced 375,791 long tons of broken rock, however an average size blast will produce 220,000 long tons.

What secondary blasting does remain to be done, is usually accomplished with 60 percent dynamite, either plastered on the boulders, or placed in short drill holes. Presently



HUGE SIDE DUMP TRUCKS carrying 45 tons of taconite transport the ore from the open pit to the world's largest gyratory. Trucks dump loads directly into a 60-inch gyratory crusher capable of handling 3,500 tons per hour.

HARD, ABRASIVE TACONITE at Babbitt open pit is handled by electric shovels and 45-ton capacity, tractor-trailer units. The shovel shown above is equipped with 5-yard bucket which is somewhat smaller than rated capacity.

FIGURING IMPORTANTLY in secondary blasting are tractors containing compressor and Leyner. Recent progress has been made using these machines to put down five or six satellite holes to 6-foot depths around jet-pierced blast holes.

all blasts, including primacord detonation, are set off with caps and fuses.

Large Shovels, Small Buckets

To muck out the extremely heavy, and abrasive taconite, Reserve operators found that best results were obtained by using a large capacity electric power shovel, with a smaller capacity bucket. As a result eight-cubic yard power shovels with five-cubic yard buckets are being used. There are presently eight of these units in operation. Past experience with larger buckets showed that maintenance costs on shovels were abnormally high, and some mucking speed was sacrificed. Excessive maintenance costs were also realized with lighter shovel units, due to the extreme weight of the taconite.

Taconite is dumped by the power shovels into large 45-ton side-dump Diesel tractor trailer units, which haul the rock approximately one-half mile to the 60-inch primary crusher. Enough haulage units service the power shovels, so that there is no down time for any shovel. Each shovel also has a large bulldozer with it at all times for clean-up work. Under the present blasting system most of the taconite is broken in place, and not scattered about, thus causing minimum travel time for the mucking units.

World's Largest Crusher

The 45-ton tractor-trailer haulage units dump directly into a 60-inch primary gyratory crusher, said to be the world's largest, which crushes the taconite to minus-8-inches. Weighing 1,200,000 pounds, and driven by two 500-horsepower motors, the crusher can crush 3,500 long tons per hour. Excavation to house this crusher as well as the three 30-inch gyratory crushers underneath, consisted of an opening 170 feet deep, and 80 feet in diameter cut out of solid rock. Taconite from the 60-inch crusher, falls directly into the three 30-inch gyratory crushers, at which point the rock is further reduced in size to minus-3-inches at a combined rate of 3,000 long tons per hour. Each secondary crusher has a 300 horsepower motor.

Approximately 50,000 long tons of taconite go through the crushing plant each day. The extreme abrasive nature of the siliceous taconite necessitates the replacement of the crusher liners when approximately 1,230,000 tons of ore have been processed. Changing of the mantles in the crushers is done when an average of 1,175,769 long tons of taconite has been crushed. The replacement process is quite lengthy. The wearing out of the concaves determines the time. Every Tuesday all necessary repairs to the mine plant equipment are done. Adequate stockpiles enable the flow of taconite to the concentrator to go on uninterrupted.

After passing through the secondary crushers, the minus-3-inch product falls on a 60-inch wide by 1,000 foot long steel cable rubber covered belt, the only one of its kind. This belt, driven by three 400 horsepower motors, and with a capacity of 3,500 long tons per hour, conveys the crushed taconite 150 feet above the ground into two storage bins with a combined capacity of 9,800 long tons. From here, the taconite is loaded into 87 long ton capacity railroad cars, and shipped 47 miles, in 125 to 135 car trains to the E. W. Davis Works at Silver Bay. Cars may be loaded underneath the bins at the rate of one car every two minutes. Mechanically operated chutes, controlled by an operator, make this fast loading possible. The train does not have to stop to load.

47 Mile Company Railroad

Construction of Reserve's inter-department railroad was, in itself, an enormous undertaking. Surveyed in 1949, the railroad was pushed through 47 miles of virgin Minnesota wilderness; crossing four rivers, and encountering muskeg swamps up to 27 feet deep and 3,000 feet long. Over 2,000,000 cubic yards of roadway excavation was required on the main line, and more than 1,500,000 cubic yards of granular fill was used. Utilizing 140-pound steel rail, the standard gauge railroad climbs from 867 feet above sea level at Silver Bay to 927 feet in the first 17 miles, then drops 188 feet to the Babbitt end of the line.

Diesel-electric locomotives haul cars equipped with swivel couplings for dumping in a rotary tipple without being detached from one another.

A Series of Identical Units

The concentrating operations at Silver Bay were designed and constructed in a series of identical units. There are 12 units, plus one additional unit at Babbitt which has a capacity of 300,000 long tons of pellets per year. Reasons for this type of design again reflect on the foresight of Reserve management in their planning for the future. When additional capacity is desired it will be a relatively simple matter to install similar units alongside of the existing ones.

Fine Crushing Plant

Upon arriving at the Davis Works at Silver Bay, the minus-3-inch taconite is dumped from the cars by means of a huge rotary tipple, which can dump up to 3,500 tons per hour. With the swivel couplings on the cars, no uncoupling of cars is necessary for dumping. An 84-inch pan feeder feeds the ore to a five-foot wide by 312-foot long conveyor which leads up into fine crushing storage bins. A distributor belt at the top of the bins distributes the taconite into any one of four storage bins, having a capacity of 4,800 long tons each.

DIRECTING ACTIVITIES at the Babbitt Division are left to right: Ray Bertie, chief mining engineer; F. E. McIntyre, mine superintendent; Floyd Erickson, general manager Babbitt Division; and Ken Kurry, industrial engineer.

Further reduction of the coarse taconite is done in the fine crusher building containing, in two tiers, eight seven-foot shorthead cone crushers, and eight six- by 12-foot double deck vibrating screens. First stage fine crushing reduces the taconite to minus-1¼-inches, and second stage fine crushing reduces the taconite to minus-¾-inch. Automatic controls and a centralized lubrication system make it possible, if necessary, for one man to operate the entire fine crushing section.

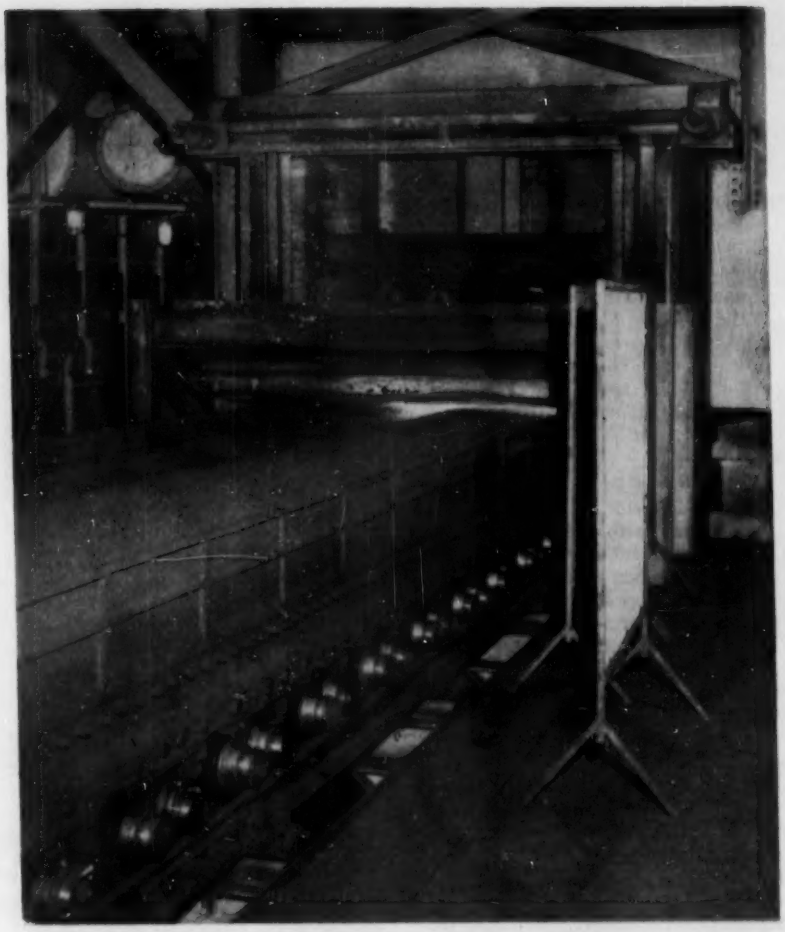
The fine crushing building is noticeably free from dust, due to the excellent dust control system operating within the building. A centrifugal type dust collection system is used within the fine crushing building. Heavily insulated building walls help in maintaining a very close control over air pressure, density, and temperature needed for the effective operation of the system. At every point of possible dust contamination a dust control unit may be seen. Dust units are interlocked with the machinery they serve, i.e. machinery will not operate if the dust collection unit is not operating correctly. A total of over 36 dust collection systems are in use, varying in capacity from 15,000 to 56,000 cubic feet per minute. Both dry and wet systems are employed, including an electrostatic unit in the pelletizing plant. Water sprays are used profusely wherever needed.

Concentrating Plant

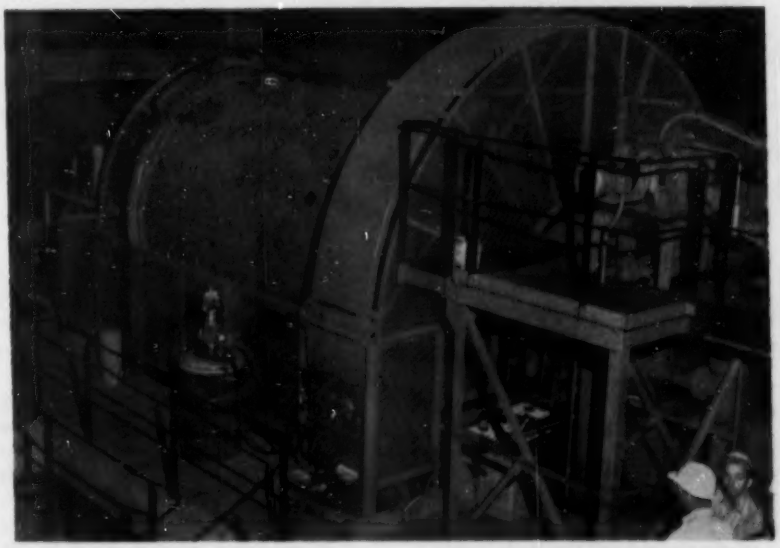
Fine crushed taconite is transferred underneath the main highway leading to Silver Bay to a large transfer bin, while enroute to the mill bins. The concentrating building itself is 1,307 feet long, with a wide roadway along the upper level of the building, allowing inspection or maintenance trips through the mill by car or truck.

Twenty-four concrete mill storage bins, two bins for each of the 12 concentrator sections, having a capacity of 3,000 long tons each, allow ample storage space for the fine crushed taconite. Minus-¾-inch material is fed from the mill storage bins on 48, 30-inch wide, variable speed belts to 12, 24-inch wide belts which in turn convey the taconite to rod mills at the rate of 155 long tons per hour each.

At this point water is also introduced into the rod mill feed. Water to supply the concentrating section is pumped from Lake Superior via a 14-foot diameter pipe, at the rate of 105,000 gallons per minute, by three 1,500 horsepower centrifugal pumps located in the power house. Approximately 10,000 gallons of water are



HEAT HARDENED PELLETS emerge from horizontal furnace on traveling grate. The pelletizing furnace, designed by Arthur G. McKee & Company, utilizes downdraft heat treatment; the machine measures 6 feet wide by 168 feet long.



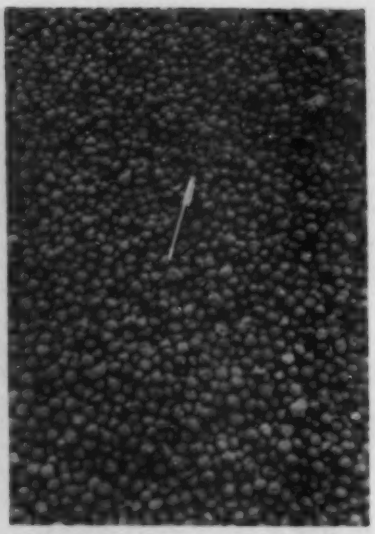
TACONITE FEED is reduced to minus-10-mesh size by 10½-foot diameter by 16-foot long rod mills. Each of the 12 sections of the E. W. Davis Works contains one rod mill which is capable of handling 155 long tons per hour.

used to process one ton of taconite.

Each 10½-foot diameter by 16-foot long rod mill, reduces the taconite to minus-10-mesh at a rate of 155 long tons per hour. Driven by an 800 horsepower motor, the mills rotate at 15 revolutions per minute. Rod consumption is approximately one pound per ton of taconite.

Rod mill discharge flows into a bank of 24 two-drum, belt-type, cobbing magnetic separators, each with a capacity of 77 long tons per hour. This is the first point of magnetic separation in the concentrating process. The primary magnetic units at this point make a concentrate containing approximately 46 percent iron, while discharging about 35 percent of the feed as tailing.

Upgraded feed flows on into 24, 10½-foot diameter by 14-foot long ball mills, which further reduce the taconite to 80 percent minus-325-mesh, at a rate of 50 long tons per hour each. Rotating at approximately 16 revolutions per minute, each mill is driven by an 800 horsepower electric motor. Ball consumption is about one half pound per ton of taconite. Rougher magnetic separators located beneath the ball mills separate the ball mill discharge. The 96 separators having a capacity of 12 long tons per hour, feed into 24, eight-inch by 12-inch rubber lined sand pumps. Sand pump discharge is pumped to two banks of four cyclone classifiers each per section of 12 units, which classify the rougher separator concentrate. Cyclone underflow is recirculated through the ball mills, while the overflow containing approximately 53 percent iron at



FINAL PRODUCT is a ¾-inch pellet which is richer in iron content than lump ore and makes better furnace feed.

85 percent minus-325-mesh, flows on to primary hydroseparators.

Concentrate 64.5 Percent Fe

The 24 cone-shaped primary hydroseparators are of the "thickener type," and are 16 feet in diameter. Diaphragm pumps pump the underflow to finishing magnetic separators, while the overflow is discharged as tailing. Finishing separators are of the double drum type, and there are six per section of 12. Each separator has a capacity of 7 long tons per hour, and produces a final concentrate assaying 64.5 percent iron. The concentrate is pumped to 24, 16-foot, thickener type finishing hydroseparators. Underflow is pumped to a bank of vacuum filters, and the overflow is discharged as tailing.

Twelve disk-type vacuum filters (one per section) produce a filter cake containing 64.5 percent iron, and 9.5 percent moisture. One two-stage vacuum pump per filter provides the required amount of vacuum for each unit. The filter cake is discharged on a conveyor leading to the pelletizing plant at the rate of 50 long tons per hour per unit. Filtrate is collected in a filtrate tank and returned to the circuit at the finishing hydroseparator feed box.

Pelletizing Plant

As the finished concentrate is so fine, it cannot be easily shipped, nor charged directly into blast furnaces. In the furnaces, the fine concentrate would not permit the proper flow of the blast furnace gases necessary for reduction to pig iron; also the concentrate would blow out the furnace stack. The only solution to the problem of fineness is to agglomerate or consolidate the concentrate. Reserve engineers have found the pelletizing method of agglomeration the most suitable.

Briefly the pelletizing process involves rolling and rerolling the concentrate in large revolving drums. As the particles roll down the inside of the drum, additional particles are gathered by the small pellets. However, since the pellets would break up when dry, they are fired in a furnace to harden them. When finished and ready for shipment, the pellets are porous, but hard enough to stand the shock of loading.

The first step in pelletizing is the conveying of the filtered concentrate to storage bins. There are three storage bins for each of six pelletizing lines. Each bin has a capacity of 450 long tons. From the bins, the concentrates are conveyed to 18 nine-foot diameter by 30-foot long, concrete lined, steel balling drums. Each drum has a capacity of 30 to 40 long tons per hour, and rotates 10 to 11 revolutions per minute. Approximately nine pounds of bentonite are added to each ton of concentrate entering the balling drum.

The concentrate, now in the form of soft pellets next enters 18, 8- by 12-foot long coal coating drums. Here the pellets are coated with fine anthracite coal, using from 60 to 65 pounds of coal per ton of pellets. Coal-coated pellets continue on to six pelletizing machines or horizontal furnaces, hav-

LOWER SECTION of E. W. Davis Works is over a quarter of a mile long. Shown above is part of the installation on the lower floor. At right are double drum magnetic separators used as finishers. At left is the filter section.

ing a capacity of 90 to 110 long tons per hour each. Pellets enter the six-foot wide by 168-foot long pelletizing machine, on a grate traveling 60 inches per minute. A distributor screen feeds the pellets on to the grate, forming a layer 12 inches thick. The grate travels under an oil furnace having 22 burners, which heat the pellets to a temperature of 2,400° F., and insures uniform heat treatment throughout. Heat treatment of the pellets is accomplished through the combustion of the coal, rather than from the heat of the furnace. The heat treating process also reduces magnetite (Fe_3O_4) to hematite (Fe_2O_3). After quenching in a lump quenching drum, the ⅝-inch pellets are conveyed to loading and storage areas.

Storage and Harbor Facilities

Extensive storage, harbor, and boat loading facilities, greatly facilitate shipment of the pellets from the E. W. Davis Works. Finished pellets are stored in five bins, having a capacity of 6,000 long tons each, and also in a storage area which can accommodate another 1,700,000 tons of pellets. Such large storage space is needed to hold stockpiles of pellets produced over the winter months when Lake shipping comes to a halt. Storage bins are kept constantly full, and are fed from either the plant or the stockpile. Boats are loaded directly from the bins by two belt-type loaders, arranged to receive the pellets from any one of 10 belt feeders, feeding from the five storage bins. The rated capacity of the loaders is 3,550 long tons per hour. Each loader has a movable boom section capable of loading 40 feet from the face of the dock. Moving by rail, horizontally across the dock, the boat loaders are anchored when not in operation or during a storm. During storms over Lake Superior, winds frequently reach high velocities; therefore, to protect the loaders under such conditions, they are equipped with automatic rail clamping devices, operated by an anemometer and voltmeter. When wind velocities reach 88 miles per hour, the instruments automatically clamp or anchor the loaders in place.

The harbor at Silver Bay was formed by two breakwaters which extend from the shore to two small islands. The quay wall is 2,500 feet long, allowing ample room for the boats to maneuver.

Two Towns Were Built

Housing the families of over 2,200 men employed by the Reserve Mining Company, both at Silver Bay and Babbitt, necessitated the building of two complete towns.

Already 471 houses have been built at Babbitt, as well as an elementary school, staff building, shopping center, hospital, and other facilities. Construction of 75 additional homes is presently underway. Silver Bay has at the present time 636 housing units, with another 78 under construction, in addition to the shopping centers, schools, and other facilities. With the exception of Duluth, Silver Bay is expected to become the largest city on the north shore of Lake Superior.

Congratulations to the staff of Reserve Mining Company, and the owning companies, who had the courage and the foresight to build the first commercial taconite plant in the United States. Reserve has been the pioneer and the leader in the growing taconite industry. Thanks to Reserve for cooperation and the opportunity to present the first full report on Reserve's operations.

SHIP LOADING FACILITIES at the E. W. Davis plant include five storage bins which total 30,000 tons capacity. Two ore bridges leading from the bins load ore carriers such as the one docked in the background.

STOCKPILED PELLETS are reclaimed by a 2½-yard Diesel power shovel which loads a 22-cubic yard, end dump, Diesel truck. Large stockpile is required to provide storage over winter months when Lake shipping halts.

Migration of a Manganese Producer

In three weeks Stovall Manganese closed a California plant, moved it 1,350 miles to Montana, and set it up for operation

Following the tracks of Stovall Manganese Company, one of the nation's most successful producers of manganese concentrates, is an exhaustive job. This fluid organization can move all over the country, recover small deposits, and relocate again in a new area in a matter of a few short months. Take a recent case history as an example. In less than a month—exactly three weeks to the day—Stovall Manganese accomplished the following work:

1. Dismantled a 650-ton-per-day concentrator and a 1,000-ton-per-day crushing plant;
2. Loaded this machinery, plus mining equipment, on trucks and moved 1,350 miles from a southern California location to Butte, Montana;
3. Reassembled the plant under a roof and had it operating at full capacity just 21 days after the decision was made to move.

The above sequence was by no means the end of the chain of events. The Butte plant operated for two months on ore which was mined from an outcrop near the western city limits after which everything was again packed up and trucked south to Arizona where it was again set up for operation. Stovall Manganese has in mind two deposits—one near Mammoth, Arizona and the other near Casa Grande, Arizona—for exploitation in the immediate future. It took eight days to make the move from Butte to Arizona and this time included loading trucks and moving to the new site.

The design and arrangement of crushing, sink-float, and jig components in semi-portable units facilitates rapid erection or dismantling and enables Stovall Manganese to broaden the scope of its operation. With regard to equipment design, one item is worthy of note. The pulsating jigs were planned specifically for manganese concentration. Half of an old automobile tire is used to make the diaphragm connection between the conical hutch and the screen bed of the jig.

CONCENTRATES produced in the mill are gathered in the hopper, shown above, and trucked to the purchase depot.

At Butte the plant ran 24 hours per day, seven days per week. Manganese concentrates were shipped to the Butte-Philipsburg depot at a site adjacent to the Stovall mill. The 1,000-ton crushing plant was set up at the mine, about two miles from the concentrator location.

Crushed feed from the mine was screened at the mill with the plus ¾-inch fraction reporting to an Akins, Number 2, sink float installation. Finer sizes are treated in two parallel but nearly identical jig circuits. Each circuit contains two machines, each one of which consists of three jig cells. The crushing plant at the mine consisted of Austin-Western and Pioneer crushers, Telsmith and Pioneer screens, and interconnecting conveyor belting.

It took 18 truckloads to transplant mining and milling machinery from California to Montana. The concentrating equipment was mounted on low boy trailers for the most part. The sink-float unit was on one trailer and the jigs were on a second trailer. At Butte, the trailers were parked side by side, blocked in place, and the components covered with roofing while the sides remained open.

Following the installation of a roof, circuits were connected by piping and launders. Conveyors were installed to deliver feed and to handle mill products. Certainly the outstanding features of the plant were the simplicity of design, the portability of units and the novel jigs. The company can move to almost any point in the country where ample water is available. In this connection it should be mentioned that characteristically about 75 to 85 percent of the water is reclaimed by Stovall operations.

The mine crushing plant reduced the ore to minus 3 inches in size, and this product was delivered to the mill by trucks which unloaded at a steel hopper or at the mill-feed stockpile.

A feeder draws the ore from the receiving hopper at the mill and a conveyor transports the minus 3-inch feed to a Kennedy-Van Saun screen for a three product separation. Plus ¾-inch particles are conveyed to the sink-float plant while the plus ⅜-inch feed reports to ¾-inch Davis jigs. The minus ⅜-inch fraction is washed in a log washer and treated in ⅜-inch Davis jigs.

The sink-float plant handled about 25 percent of the feed. This section

is composed of an Akins separatory vessel with a 24-inch-diameter spiral; an Allis Chalmers, 4- by 12-foot low head vibrating screen for product washing and media drainage; a Dings magnetic separator for recovery of ferrosilicon media; and an Akins densifier for dewatering the reclaimed media. The media in the separatory vessel was maintained at a specific gravity of 2.44 by regulating the water content of reclaimed media returned to the circuit.

Treatment in each of the jig circuits was identical with the exception that the minus ¾-inch product was first washed. Each circuit was composed of two banks of jigs which were fed in parallel. Each bank contained three cells which step down from the feed end to the discharge end. A coarse and a fine concentrate was recovered from each cell. The final tailing was piped to a settling pond so that water could be reclaimed.

The jigs are a pulsating type similar in some respects to Pan American placer jigs. Pulsation of the three diaphragms on each bank is obtained by a series of eccentrics mounted on a common jack shaft. The conical bottom of each cell is joined to the upper section containing the bed by an old automobile tire which is clamped on each part. The 3 to 4-inch bed on the jig is built up of coarse particle sizes too large to pass through the screen to the hutch where the fine manganese concentrate collects.

A cup and pipe discharge was used to facilitate removal of coarse concentrates which stratify at the bottom of the cell bed. The pipe extends vertically from the top of the jig bed to below the screen surface, and is connected to an outlet below the bed. A cylindrical cup, open at both ends, surrounds the vertical pipe and extends from above the pulp surface through the bed to just above the screen. Coarse manganese concentrate enters the cup in the space above the screen and builds up to the top of the inner pipe; eventually it is washed into the pipe discharge. Since the pipe can be adjusted vertically, the level of the bed on the screen can be varied to suit operating conditions.

Mining at Butte was done at the Zorina propery just south of the school of mines. Fifteen men were employed in recovering the black manganese oxide from the outcrop. Equipment used included hand held sinkers and tractor-loaders. The Butte operation marked the eighth plant set up for Stovall Manganese. Heretofore, this company had confined activities to the southwest, largely in California and Arizona. A plant is also operating in Arkansas at the present time.

THE MANGANESE concentrator was started at Butte just three weeks after the decision was made to move from Barstow, California. The plant features simplicity of design. Stacking conveyor, at left, handles float rejects.

MOBILITY of mill is emphasized in this photograph showing the trailer which mounts the sink-float unit of the concentrator. This trailer was disconnected from the tractor and blocked in place on the mill site.

AT THE MINE an Allis Chalmers tractor-shovel loads broken ore on one of the trucks traveling between the open cut and the crushing plant.

AT THE MILL, minus ¾-inch feed from the 1,000 ton per day crushing plant at the mine is delivered to the mill feed stockpile for processing.

INTERNATIONAL HARVESTER TD 21 tractor is used to scoop out the settling pond at the Stovall mill. Most of the water is reclaimed for re-use in the 650-ton concentrator. The mill features simplicity of design.

DRILLING TWIN SHAFTS at Mid-Continent Uranium. At right the 36-inch reaming bit is being lowered into air shaft. Steel headframe over hoisting shaft is at left. Churn drill in center is over 12-inch pipe and bell line hole.

How Mid Continent Uses Twin Drill Holes For Mine Shafts

A new, fast, and cheap method of developing uranium mines has been engineered and applied by Mid-Continent Uranium Corporation at its All States mine in the Poison Canyon section of the Grants New Mexico uranium district. The new method, using twin circular drill holes for shafts, is an expansion and adaptation of shallower Calyx hole shafts previously used in the Temple Mountain district of Utah. Vice president and general manager Norman Ebbley of Mid-Continent has engineered the new method and has been right on the job supervising the shafts to completion.

Here's how the new method works. After a plan has been developed for mining the ore body, and the shaft sites selected, a churn drill is moved to shaft site. A vertical 12-inch-diameter, churn drill hole is immediately drilled to a point at a predetermined depth and bottomed well below the uranium ore horizon.

Simultaneously, a second and larger churn drill is brought in for drilling a 36-inch-diameter round hole 10 feet away from the initial smaller hole. A 21-inch pilot hole is first drilled to a depth of 20 feet. Then it is reamed out to the full 36-inch diameter. A special 3¾-ton reaming bit is used. This bit is shown in one of the pictures. The reaming bit fills the smaller diameter hole full of cuttings. Therefore, the reaming must be kept several feet above the pilot hole bottom. The cuttings from the reaming drop to the bottom of the pilot hole where they can be bailed out and hoisted to surface. Occasionally, it is necessary to loosen these cuttings with the pilot bit before they can be bailed.

Normally, a 400-foot-deep, 36-inch churn drill hole in sediments such as that at Mid-Continent can be drilled in 30 to 35 days. At Mid-Continent, the Minerals Engineering Company of Grand Junction, Colorado was prime contractor with Franklin-Cowan of Texas acting as sub-contractors and doing the actual drilling. The 36-inch-diameter hole, completed to that depth and completely cased, cost $43.50 per foot.

The ore body at Mid-Continent is 341 feet deep. For mining, a sub-level 385 foot deep was established with the hole bottomed at 400 feet to give an adequate sump and room for bucket loading.

When the hole has been completed to the desired depth, a special gauge is lowered into the hole to insure that the hole is round and has not tapered toward the bottom.

How the Hole Is Cased

The next step is to lower the 5/16-inch steel casing into the hole with the churn drill. The complete string of casing for this 400-foot-deep hole weighed about 15 tons. The first length of casing, which is made in 16- to 20-foot lengths, is lowered into the hole. When the top of the casing is about two feet above the collar a circular steel band or casing ring is welded on to the first section. This ring fits on the outside of the casing and extends half its height (6 inches) above top of the casing. After the ring has been welded on, the casing is held in place while the second section is raised by the churn drill and lowered into the ring. It is absolutely essential that the casing string be straight. Accordingly, the second section is plumbed vertically by the use of two transits. These are set 90° apart and several hundreds of feet from the drill hole. The second section of casing is lined up absolutely vertical using the transits and then welded to the casing ring. Using this ring precludes the necessity for squaring off the ends of the casing before welding. This procedure is repeated until the complete casing string has been lowered to the desired depth, or the full depth of the hole.

The 12-inch drill hole serves as a service hole in that a compressed air line, electrical power cable, the bell

cord, a water line, and a pump column are all placed in this hole. Obviously, no pipes or cords can be used inside the 36-inch-diameter hoisting shaft. In initial development, it is most essential that the connection between the 36-inch hole and the 12-inch hole be made as rapidly as possible so that the bell signaling system can be immediately established. If the area is wet, a deep well pump can be placed in the 12-inch churn drill hole to lower the water table, while the larger hole is being completed and the drift started from the 36-inch hole.

Second Shaft is Manway

As soon as the first 36-inch hole is completed and cased, the large churn drill is moved to a second hole site. At Mid-Continent this was 150 feet away. The second hole serves as an escape and ventilation shaft. It is drilled the same as the first shaft, and cased identically. When the casing is lowered, the vertical steel ladders are welded inside and to the casing. These are made from ¾-inch angle iron. Every 30 feet in the manway, a landing stage is set. These landings are made so that they can be easily removed and taken out of the shaft so that, in an emergency, supplies or equipment can be raised or lowered. The triangular-shaped landings are also made from welded ¾-inch angle iron set in and supported by three 2-inch lengths of pipe, welded to the casing. A groove is cut in the top of each of the pieces of pipe so that the landing can be raised and tilted backward for a man to pass through. To take out the landing, it is tilted back, turned, and simply lifted out of the pipe sockets.

Connecting the Shafts

The general practice is to case the hoisting shaft to a point just above the place where the drift is planned. After the casing string has been dropped to that point, a man is lowered into the shaft on a special open cage. He takes with him a specially built Minerals Engineering Company jack-hammer with a 15-inch jack leg. Air hoses are strung down the shaft to supply air. The miner sets this machine up inside the hole with one end of the jack leg on the opposite wall. He drills out a round using short lengths of steel. The round is blasted electrically with the muck dropping into the sump. The next step is where engineering know-how pays off. Obviously it would be impossible to get down into the 36-inch-diameter hole to muck the round out. Accordingly Mr. Ebbey initially erected the 35-foot steel headframe over this hole on skids. After the round is blasted, the hoist is hooked on to the headframe and it is pulled 10 feet back toward the hoist house. One of the churn drills is moved in over the drill hole and the 36-inch bit lowered to the bottom. The muck from the round is broken up by alternately raising and lowering the bit. In this instance there was a 40-foot sump so the first drift round just about filled the sump. After the rock has been broken up it is easily and quickly bailed out with a churn drill bailer. The headframe is then skidded back into place using the hoist and a block anchored to a deadman on the opposite side of the hole from the shaft. The miner is lowered into the shaft again and he drills and blasts another round. The procedure is repeated until the drift breaks through into the 12-inch hole and room for a round of muck is provided on top of a bulkhead in the shaft.

VULCAN-DENVER gasoline-powered hoist is used to hoist the two-ton ore bucket. Special non-rotating hoisting cable is used. The 31-inch circular bucket is used without guides inside the 36-inch-diameter shaft.

MANWAY SHAFT CASING showing the size of each of the twin shafts. Norman Ebbley, Mid-Continent general manager, raises steel landing.

Drifting is then pushed to connect the air hole with the air shaft.

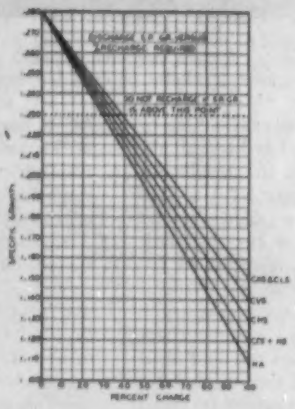
The sublevel drift connecting the two shafts is below the ore horizon. From it two main haulage ways are turned and driven under the ore to the end of the ore body. Raises are driven through the ore, belled out, and stoping started at the top of the raises. Raises are interconnected and broken ore slushed by electric-powered hoists into the raises.

The muck is hoisted in a round, 31-inch-diameter bucket holding 2 tons. Non-rotating hoisting cable is used. The bucket is tipped over to dump in a 30-ton steel ore bin. A special dumping cradle built into the headframe is actuated by two air cylinders. The hoistman controls movement of the cradle by positioning a four-way valve in the compressed air line. Men and supplies are transported through the shaft in a special light weight two-deck circular cage. A Vulcan-Denver light duty Model GFT 20/40 mine hoist powered by a Ford gasoline motor is used for hoisting. In the unlikely event of hoist trouble, men can be hoisted out of the shaft by attaching a block to the headframe, clamping the hoisting cable to a truck, and driving the truck away from the shaft until the cage reaches the collar. The truck is then backed up to lower the cage.

Mr. Ebbley is sure this new method has great possibilities and sees no reason why the system won't work to depths of 1,500 feet in sedimentary formations. It has met expectations at Mid-Continent.

How To Take Care of Mine Storage Batteries for Trouble-Free Service

The modern mine storage battery, coupled with modern automatic charging equipment, properly set, will require practically no maintenance other than an occasional water addition and inspection. However, batteries do require care in operation.



Attempts to overwork a storage battery result in over-discharging. This can pull specific gravity below safe limits, often resulting in reversed cells and permanent damage.

Discharging beyond design limits makes recharging more difficult, increases charging time, and often results in an upset schedule.

A battery should be recharged before specific gravity drops below the safety limits. Recharge directly after the discharge cycle to insure capacity. This will also prevent hard sulphate from forming, which is detrimental to battery life and capacity.

The most common abuse, however, is overcharging. This can slash battery life by more than 50 percent. It is important that charging limits be understood. No amount of overcharging will increase the battery capacity or raise the specific gravity above its fully charged condition (1.265 to 1.285).

The chart shows direct relationship between specific gravity and percent recharge required on a discharging battery. *Note dotted horizontal line.* If normal daily capacity requirements do not reduce specific gravity below this point, battery can be charged every other day, thus increasing life expectancy.

It is important to give some consideration to carrying certain replacement parts for your batteries, so that accidental breakage can be handled quickly in the field. Very often, availability of spare parts when needed can result in considerable savings in downtime and minimum interference with production schedules.

A neglected battery will continue to deteriorate even if it is not used. Repairs should be made promptly, if battery life is not to be cut drastically.

A battery which is continuously wet on top is not being maintained correctly. If frequent additions of water are found necessary, investigate for over-charging and correct the condition immediately.

Always be sure the vent caps are in place on every cell at all times, whether the battery is on discharge or on charge. The only time it is necessary to remove vent caps is to add water.

Always remember that storage batteries generate explosive gases which will ignite readily when coming in contact with an open flame or spark. Be sure all traces of gases are blown out of the cell before approaching it with an open flame.

Do not lay tools or anything metallic on top of a storage battery.

Keep your battery clean and dry.

Follow instructions and accept the help of your battery service engineer. This way, you can expect long, trouble-free service from your motive power batteries.

This and other modern techniques for battery care are available from the free manual published by C&D Batteries, Inc. of Conshohocken, Pennsylvania.

How Chino Mines Controls Dust

The Chino Mines Division of Kennecott Copper Corporation has been making a series of tests with Norlig, a by-product of the paper industry, as a dust controlling agent. The initial laboratory tests were made by Chino's Metallurgical Department at Hurley, New Mexico. Field testing

APPLYING NORLIG to a test road strip at Hurley, New Mexico. This *Kennecott Chinorama* picture shows Temple McCutchen, assistant mill metallurgist, carrying the Norlig in a bucket.

in the open pit Santa Rita mine and at Hurley have been encouraging. Norlig solution is sprinkled on heavily travelled roads to hold down dust which makes it more comfortable for drivers and also prevents the dust from getting into the equipment.

United States

Personalities in the News

DR. FREDERIC M. CHACE is the new assistant director of exploration for the M. A. Hanna Company. He will work with DR. JOHN K. GUSTAFSON, director of exploration, in Cleveland, Ohio. Dr. Chace's experience includes geological and mining work in Australia, Bolivia, Peru, Chile, Mexico, and Canada. During the war he was with the War Production Board in Washington, D. C. and later with the U. S. Geological Survey. He first worked for the Hanna Company in 1951, and in 1952 joined the Gold Fields American Development Company, Ltd., the United States subsidiary of Consolidated Gold Fields of South Africa, as mining geologist.

Arthur G. Johnson is the new vice president and general manager of the Ozark-Mahoning Company in Rosiclare, Illinois. He succeeds **John G. Trewartha** who has retired but will continue as a director of the company. Mr. Johnson started work for the Mahoning Mining Company 20 years ago as a mining engineer and geologist. He discovered a large deposit of fluorspar which enabled the company to greatly expand operations. Mr. Trewartha came to work for the firm in 1910 when it was known as Vinegar Hill Zinc Company. In 1940 he became general manager of the Mahoning Mining Company in charge of the mines and mill of the company in the Rosiclare area.

J. D. Longacre has been appointed to the post of deputy mine inspector in New Mexico. Mr. Longacre previously was a shift boss at the American Smelting and Refining Company mine in Vanadium and will have his new headquarters in Albuquerque.

C. J. Calvin has established a new engineering firm, C. J. Calvin and Associates, with headquarters in Hibbing, Minnesota.

Carl Ettinger was re-elected president of Moki Oil & Rare Metals Company, Santa Fe, New Mexico. **George Lavender**, president of the Pot Creek Lumber Company, was re-elected treasurer. **John C. Dillon**, president of the Sante Fe Book & Stationery Company, was chosen to be vice president and secretary. Other directors are **John N. Eddy**, Santa Fe, and **Ralph C. Rounds**, Wichita, Kansas.

A. L. Hayes will serve as manager, **R. E. Radabaugh** will be in charge of mining operations, and **K. C. Apland** will be mill chief of the Mexican Hat, Utah, uranium operation of the Texas-Zinc Minerals Corporation, which is jointly owned by the New Jersey Zinc Company and The Texas Company. Mr. Hayes will have his offices in Grand Junction, Colorado.

Jack C. Turner began his new job as president of Colonial Nuclear Industries Inc. of Grand Junction, Colorado by announcing plans for immediate expansion of the Company's oil and uranium production. Formerly president of Red Hill Uranium Company, he replaces **Robert I. Ludwig** as Colonial president. To assist Mr. Turner in this program of expansion, a specialist in corporate reorganization, **Ira L. Abelow** of Denver, has been named vice president. Mr. Abelow has developed a wide knowledge of raw materials and mining during his many years of experience in China, Japan, Europe, and Africa. He was also a transport commander for the United States Army and a military government officer in Korea.

Alvin J. Thuli was recently named assistant chief engineer of the Utah Copper Division, Kennecott Copper Corporation. Previously he was assistant to the chief engineer of the Company's western mining division.

B. M. Snyder of Los Angeles has been appointed first vice president and chief engineer of the Consolidated Virginia Mining Company, and has been named to the board of directors. Other new board members are **Anson S. Bilger**, San Francisco, and **Fred E. Murrish**, Los Angeles. Company headquarters are in Los Angeles.

Herbert E. Harper and **Philip M. Lindstrom** have been named to the positions of chief geologist and chief mining engineer for Hecla Mining Company, Wallace, Idaho. These were formerly combined into one job held by **Robert E. Sorenson**, who has moved to Seattle, Washington to take charge of a new venture for the subsidiary firm, Polaris Mining Company. Mr. Harper worked for Cordero Mining Company in Nevada before joining Hecla in 1946. Mr. Lindstrom joined Hecla in 1942 and before that was with Idaho-Maryland Mining Company, Grass Valley, California.

Graydon Sallee, former superintendent of the Atomic Energy Commission mill at Monticello, Utah, will be superintendent of a new uranium processing mill at Rawlins, Wyoming for Lost Creek Oil & Uranium Company.

A. J. O'Connor, vice president and general manager of Consolidated Coppermines Corporation, Kimberly, Nevada, recently announced the appointment of **Wayne Manson**, formerly personnel director to the position of chief accountant, succeeding **E. C. Wharton**, resigned. **Jim Long**, cost accountant, was advanced to the position of personnel director.

ROSS D. LEISK has resigned as vice president of Sunshine Mining Company in Spokane, Washington. Earlier this year he had declined renomination to the board of directors because of "impending retirement." He has been vice president and director of the company for several years, and general manager for the past 20 years. Mr. Leisk will continue to do a limited amount of consulting work.

DAVID D. BAKER is the new director of the mining division in Grand Junction, Colorado, for the U. S. Atomic Energy Commission. During the last 18 months, Mr. Baker has been deputy director and acting director, and before that was staff engineer in the exploration division. Before his affiliation with the AEC, he was with the Utah Construction Company as manager of a project to rehabilitate the tungsten mines in Korea. Other firms he has been employed with are Union Mines Development Company, Pacific Mining Company, Alaska-Juneau Company, U. S. Vanadium, Big Horn Mining Company, and American Smelting and Refining Company.

Northwest Lead Company in Seattle, Washington has been acquired by The Bunker Hill Company, but there will be no change in management, policy, or personnel. **Roger H. Cutting**, president of Northwest Lead since 1935, becomes manager of the new division of Bunker Hill and moves to the parent firm's head offices in San Francisco.

William L. DeCarbonel, consulting geologist and mining engineer, has opened a new office in St. George, Utah.

Stuart S. Merwin and **Charles E. Melbye** are now joint resident managers of Colorado Exploration Company, geological and geophysical consultants and contractors in Golden, Colorado. They formerly operated their own consulting business in Golden.

Albert E. Tizard, master mechanic, and **Perry R. Trethewey**, sawmill foreman, with Inspiration Consolidated Copper Company, Arizona, retired this summer. Their combined years of service with the company total 78.

F. R. Jones has moved up from the position of mine superintendent to general superintendent of the MacIntyre Development of National Lead Company in Tahawus, New York. **Walter M. Chapman** has been named mine superintendent.

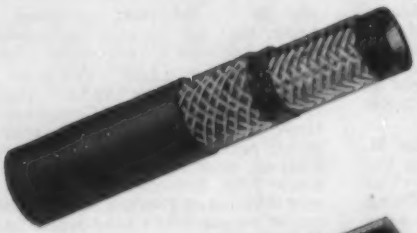
F. J. Balentine, mine engineer, has been promoted to assistant mine superintendent at the Anaconda Company's Jackpile mine, New Mexico operations, and **H.A. Mace**, cost engineer, has been moved up to planning engineer. The company has also increased the responsibilities of the following men because of their excellent work and loyalty: **F. S. Cook**, assistant to the manager of the Bluewater plant; **J. P. Herndon**, mine superintendent; **T. M. Fitch**, mechanical superintendent; **R. D. Lynn**, chief geologist; **W. J. Roberts**, mill superintendent; **J. R. Pate**, chief chemist; and **Mrs. N. McNulty**, secretary to the manager.

For long, trouble-free service . . .

use Quaker hose

AIR Extra lightweight, highly flexible hose for heavy duty work. Resists weather damage and abrasion. Non-porous tube of oil resistant rubber compound. Rugged Neoprene cover. Ideal for almost any hose installation.

FIRE Resilient, flat-folding hose saves space and gives long service in interior fire protection. Highly flexible and resistant to cracking. Leak-proof tube bonded to strong single jacket cover. Recommended for institutions, offices, ships, etc.



STEAM Many times stronger than wrapped fabric hose for general steam-handling jobs. Also lighter, more flexible and kinkproof for easier handling. Steel wire and glass reinforcing insures extra safety. Resists high pressures up to 388° F.

WELDING No twisted, tangled lines. Two lines are securely bonded together to form a single, safe hose unit. Kink-free and resistant to welding gases. Stands up to lots of dragging across rough surfaces. Especially effective on portable welding dollies.

WATER For long wear and outstanding value, this easy-to-handle hose has what you need. Reinforced with multiple plies of high tensile yarn, it takes higher than usual working pressures. Cover stands up to weather extremes without cracking or peeling.

Save time and money. Call your Quaker-Quaker Pioneer distributor first, when you need hose or other industrial rubber products. You'll find him prompt, dependable.

H. K. PORTER COMPANY, INC.

QUAKER RUBBER DIVISION
Philadelphia 24, Pa.

QUAKER PIONEER RUBBER DIVISION
San Francisco 7, California

HKP
H. K. PORTER COMPANY, INC.

Newsmakers in International Mining

Dr. Kazim Ergin has left his geophysical work in Ankara, Turkey to take up teaching duties at eknikTwTi Universite Maden Fakültesi in Istanbul, Turkey.

Arvid E. Honkala has moved up to the position of mine superintendent at the New York & Honduras Rosario Mining Company's Mochito mine in Honduras. He came to Mochito in February 1956 as a mine foreman, was shortly after promoted to assistant mine superintendent.

Ed Langston has left Butte, Montana for Lake Atabaska in Saskatchewan, Canada where he will be superintendent of the uranium operations at the Gunnar mine.

James C. Stewart has gone to Peru where he will serve as project manager for Utah Construction Company in plant construction for the Southern Peru Copper Company. Mr. Stewart, a graduate of the University of Arizona, was with the United States Army engineers during World War II and later served as construction manager at San Manuel Copper Corporation for Utah Construction.

Lute J. Parkinson, head of the mining department at the Colorado School of Mines, was a guest lecturer this summer at Technische Hochschule Aachen in Germany.

Hans Guenther Sohl, president of the August Thyssen-Huette A.G., has been elected chairman of West Germany's Federation of Iron and Steel Industries. The group reports that their industry now holds the number three spot in world steel production, behind the United States and Soviet Union. After several years as a mining engineer, Mr. Sohl began his steel career in 1934 when he became head of the raw materials division of the giant Krupp enterprises. During the war he was head of raw materials for Vereinigte Stahlwerke. After the war, with the full approval of the British Occupation authorities, Mr. Sohl joined the board of directors of Thyssen-Huette and became president in 1953.

Spada Mario, former mill superintendent at Societe des Mines de Zellidja, Morocco, has joined the staff of Ecole Nationale Superieure de Géologie at the Université de Nancy in France as manager of the mineral dressing department.

J. O. MOLLARD is the manager of the Mackeno Mines Ltd. silver-lead-zinc mine at Keno Hill, Yukon Territory, Canada, where milling operations were resumed in early July at the rate of 125 tons a day. This rate has been exceeded by the present rate of 130 tons, averaging 41 ounces of silver per ton. BRYAN W. NEWKIRK, president, says that the work began two to three months ahead of the originally planned schedule. D. CAMERON is mine superintendent; J. R. WILLIAMS, mill superintendent; and A. R. BULLIS, geologist and chief engineer.

J. B. Ward, former resident manager at the Tsumeb mine in Southwest Africa, is in charge of operations at Heath Steele Mines (subsidiary of American Metal Company) in New Brunswick, Canada. A 1,500 ton base metal plant is being constructed at this site and others on the staff are: **Dr. D. Whitmore**, geologist; **Graham Walkey**, mine superintendent; **A. McCutcheon**, assistant mine superintendents; **A. Betchard**, chief engineer; **George McLeod**, chief mining engineer; and **Verne Daughney**, mill superintendent.

Ossi E. Palasvirta, development engineer for Oliver Iron Mining Division of United States Steel Corporation, has recently returned from a six week business trip and vacation to Europe where he visited ore dressing plants in Finland, Sweden, Norway, Germany, and France.

S. B. DICKINSON has resigned as director of mines, South Australia, and has been appointed managing director for Rio Exploration Pty. Ltd. (Australia) and a director of Rio Tinto Pty. Ltd. (Australia). He will take up his duties later this year. Rio Tinto Ltd. has recently been investigating uranium possibilities in the Hall's Creek area of Western Australia.

J. S. Hay is the new general manager at East Geduld Mines, Ltd. of South Africa (Transvaal), replacing **Fred Maskew**.

D. C. Stevens has left Australia to work with Gunnar Mines Ltd., Uranium City, Saskatchewan, Canada.

Ricardo Martinez, until recently a metallurgical engineer for the U. S. Bureau of Mines in Salt Lake City, Utah, is now with Cia. Minera ASARCO in Chihuahua, Mexico.

P. K. Strong, mining engineer, has moved to Central Romana Corporation, La Romana, Dominican Republic. He previously worked in San Jose, Costa Rica.

John M. Kilpatrick has been named general manager of Arcadia Nickel Corporation Ltd. in Toronto, Canada. Mr. Kilpatrick was formerly general manager of Nickel Rim Mines Limited and prior to that was general manager of MacLeod Cockshutt Gold Mines Limited where he spent 18 years. **John H. Douglas**, associated with International Nickel Company of Canada for the past nine years, has been appointed mine manager of Arcadia's Sudbury mine.

A. Zuniga, chief of the technical department, and **Danilo Rojic**, chief of metallurgical section of the Caja de Credito y Fomento, Chile, were recent visitors to the United States as representatives of their government. American mining companies they visited include the Utah Copper Division of the Kennecott Copper Corporation and the uranium mill of Vitro Corporation of America. They were interested in obtaining metallurgical information to help establish new milling facilities in Chile, and said that Chile has developed a program of assistance for the small miner, extending from prospecting to sale of his production.

REGINALD CROWTHER, manager of National Minerals Limited, North Sydney, Australia, recently toured heavy mineral beach-sand mining operations in Florida. National Minerals, operating mining and separation plants at Newcastle and Wollongong, is the most important rutile and zirconium producer in the Sydney, New South Wales, Australia area. Mr. Crowther's visit, to check the latest plants and operating practices in the United States, is in line with National Minerals current expansion program.

Russell R. Bryan, Jr. is now a member of the staff of Cia. Dominicana de Minerales in Ciudad Trujillo, Dominican Republic. He was formerly with Russell Bryan and Associates, Inc., consulting engineers of San Francisco, California.

E. H. Browne has been elected president of the Institution of Mining Engineers for the 1957-58 term, and will succeed **Dr. William Reid** at the annual meeting in London, January 1957.

C. B. Anderson of the Union Corporation group, Africa, has been elected president of the Transvaal and Orange Free State Chamber of Mines for 1956-57, succeeding **B. L. Bernstein** of the Anglo-Transvaal group. The two vice-presidents elected for the ensuing year are **P. H. Anderson**, Corner House group, and **H. C. Koch** of the Anglo American group.

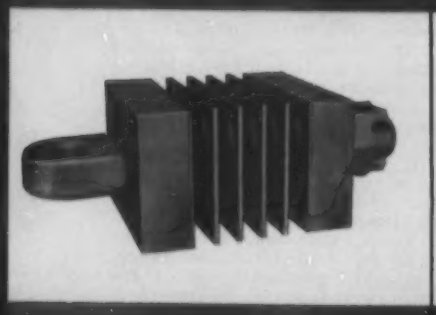
E. M. Lindenau has completed his contract as manager of Compania Minera Choco Pacifico, S.A. in Colombia and is returning to the United States. He will live in Tucson, Arizona.

William G. Wood has been promoted by the Cerro de Pasco Corporation to chief safety engineer at La Oroya, Peru.

C. E. Bartlett, formerly with the U. S. Bureau of Mines in Havana, Cuba, is now working with Cia Minera de Guatemala S.A. (controlled by Combined Metals Reduction Company) in Guatemala.

F. Bice Mitchell, professor of ore dressing at Cambourne School of Mines in Cornwall, England, is completely redesigning the South Crofty tin concentrating plant.

Still another large underground mine equips with **NATIONAL** devices



The Granby-type cars used in the new operations of Canadian Johns-Manville's Matteson, Ontario, mine are being equipped with National devices . . . as are the cars used in the company's Asbestos, Quebec, operation. These two operations are installing Willison Automatic Couplers and National rubber cushioning devices.

NATIONAL ROLLER-S RUBBER CUSHIONING DEVICES ARE USED BY CANADIAN JOHNS-MANVILLE AND CARS TO ABSORB VERTICAL AND END TO END SHOCKS

WILLISON AUTOMATIC COUPLERS COUPLE AT EITHER END OF CAR OR LOCOMOTIVE. REQUIRE NO MANUAL ASSISTANCE.

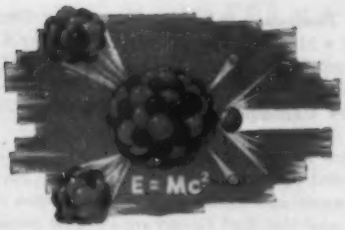
NATIONAL MALLEABLE AND STEEL **CASTINGS COMPANY**

ESTABLISHED 1868

CLEVELAND 6, OHIO

WILLISON AUTOMATIC COUPLERS
RUBBER CUSHIONED UNITS
MINE AND INDUSTRIAL CAR TRUCKS
NACO STEEL WHEELS
NACO STEEL UNITS
and SWIVEL HITCHINGS

NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY OF CANADA, LTD.
126 MACDONELL ST., TORONTO 1, ONTARIO



FISSION FACTS

Monthly Roundup of Mining News In the Atomic Energy Field

Atlas Buys 30 Percent Of Moab's Uranium Mill

Atlas Corporation's subsidiary, Hidden Splendor Mining Company, has purchased a 30 percent interest in the Uranium Reduction Company. Uranium Reduction is just starting its large new uranium mill at Moab, Utah.

Uranium Reduction Company was formed by Charles Steen's Utex Exploration Company, Combined Metal Reduction Company, and American Zinc, Lead and Smelting Company to design, erect, and operate the Moab mill to treat ores mined primarily by Utex and Standard Uranium Corporation in the Big Indian district.

Atlas Corporation operates its own mines and has milling contracts with other Big Indian companies including: Almar mine, Cal Uranium mines, Lisbon Uranium Company, Federal Uranium Company, Radon-Hot Rock-Hecla mines, and the Little Beaver and La Sal mines of Homestake Mining Company.

With the purchase of Uranium Reduction stock, Atlas gains three of Uranium Reduction's 10 directors. Atlas will also advance up to $2,500,000 to install carbonate leaching facilities at the new mill to treat high lime ores not now amenable to the mill's acid leach circuit.

By owning part of Uranium Reduction, Atlas gains the advantage of firm contracts at satisfactory prices for its uranium, and acquires important profit potentials connected with milling, plus the benefit of higher depletion allowances after milling of ore.

Uranium Reduction officers include: E. H. Snyder, chairman of the board and president of Combined Metals Reduction Company; Mitchell Melich, president; Charles Steen, vice president; and Richard A. Young, executive vice president and vice president of American Zinc.

Kennecott-Koppers Submit Feed Materials Proposal

Koppers Company, Inc. and Kennecott Copper Corporation submitted a proposal to the U.S. Atomic Energy Commission to produce uranium feed materials. The proposal calls for the design, construction, and operation of a feed materials processing plant with an annual productive capacity of up to 5,000 tons of uranium salts. If approved, the plant would be built by Kennecott and Koppers jointly, with each furnishing 50 percent of the equity capital.

The Koppers-Kennecott proposal reflects the new policy of the Atomic Energy Act of 1955 expanding the scope of private business participation in the atomic energy program. Feed materials are now made in government owned plants, but in November 1955 the Atomic Energy Commission announced its new policy on feed materials whereby it has been soliciting proposals from qualified private firms. The Koppers-Kennecott proposal is the first response to the AEC request of last fall.

At present only two processing centers have been established for the production of feed materials. One is at Fernald, Ohio and is operated by National Lead Company; the other, near St. Louis, is operated by Mallinkrodt Company. Both of these facilities, however, are owned by the government.

Under the AEC policy of encouraging private business to enter the processing field, raw materials may be furnished by the Commission for processing in private plants, or the private companies may furnish the materials themselves. All finished products would be purchased by the Commission.

Koppers Company is a leading designer of coke oven and sintering plants, blast and open hearth furnaces, chemical recovery plants and other steel mill facilities, as well as being a major manufacturer of organic chemicals. Kennecott is a major producer of copper, molybdenite, gold, and silver. It also has important interests in other metals, including titanium, zirconium, rhenium, selenium, and uranium oxide. Through its subsidiaries, Chase Brass & Copper Company and Kennecott Wire and Cable Company, Kennecott is an important factor in the fabrication of metals.

AEC Eases Payment System On Development Funds

The United States Atomic Energy Commission has modified a provision in Domestic Uranium Program Circular 5 regarding payment of development allowances. No longer is it necessary that a producer submit proof that funds received for development allowances were spent for development or exploration during the contract period or within six months thereafter.

Prior to the revision, Circular 5 established guaranteed prices for uranium-bearing ores and provided for a development allowance of $0.50 per pound of contained uranium oxide, to be spent by ore producers for the development and exploration of their properties. It also provided that proof satisfactory to the AEC be submitted by the producer that this development allowance had been spent. Producers desiring to deliver more than 1,000 tons of ore in a calendar year were and still are required to enter into a contract with the AEC.

The modification was made necessary by changed conditions in domestic uranium exploration and development. Development expenditures in early small-scale uranium mining activities were generally incurred while mining progressed. Today most ore deposits are explored and largely developed before the beginning of ore production and, consequently, before contracts are entered into with the AEC. The elimination of the accounting provision will permit maximum use of the development allowance as an incentive to uranium exploration and development.

Competitive Bid System Set for Uranium Mining

In all future awarding of uranium mining leases on federally owned land not available for mining claim location, a competitive bidding system will be used by the United States Atomic Energy Commission. This replaces the former negotiated lease. Awards will be made to bidder submitting highest cash bonus by sealed bid.

Number of U_3O_8 Shippers Declines

The number of companies from which the Atomic Energy Commission purchased uranium ore decreased by 7.4 percent during the first half of 1956 as compared with the previous 6-month period. Utah continued to lead in total number of shippers, followed by Colorado, according to lists released by the AEC. Arizona, Wyoming, and New Mexico follow in that order. A tabulation of the number of producers by states is shown below.

State	*First Half 1955*	*Second Half 1955*	*First Half 1956*
Arizona	44	60	69
California	3	5	5
Colorado	143	168	148
Montana	—	2	6
Nevada	5	4	5
New Mexico	41	38	28
North Dakota	1	—	2
South Dakota	29	23	26
Utah	174	209	206
Washington	1	3	2
Wyoming	35	65	53
Oregon	—	1	—
Texas	—	2	1
Idaho	—	—	1
Unknown area	3	19	3
Total	479	599	555

NO PART OF THIS PAGE MAY BE REPRODUCED WITHOUT WRITTEN PERMISSION

9 REASONS

WHY TRONA* USES STANDARD DRYERS

Highest Production at Lowest Cost • Easy Fingertip Control • Metal to Metal Seals • Complete Choice of Materials • Rugged Running Gear • Modern Smooth Drives • Anti-Friction Bearings • Functional Design • Uncompromised Precision

There are many reasons why successful companies . . . located throughout the world . . . buy Standard Dryers again and again! Here are only nine of the reasons why Standard Dryers are *the best profit producers*. One company, American Potash and Chemical Corporation, recently installed their fifteenth Standard Dryer . . . all operating under the difficult and severe conditions of California's Mojave Desert. This indicates that Standard Dryers are *good*.

Standard's years of experience make possible the development and manufacture of trouble free, efficient and economical dryer units—ready for handling difficult jobs! And remember! Standard's pilot dryers play an important part in solving your drying problems *before* blueprint stage.

Put your plant on a more profitable basis by *writing today* for our free 12-page illustrated catalog.

*Trona is the well known trade mark of American Potash and Chemical Corporation.

STANDARD STEEL CORPORATION

5043 Boyle Ave., Los Angeles 58 • 15 Park Row, New York 43

STANDARD HERSEY DRYERS

PILOT TESTING

RESISTO-LOY *can prolong life of your Gyratory Mantle Liners indefinitely*

Some genuine economies can be obtained through the application of RESISTO-LOY on these primary crusher mantle liners. There are many instances where mantle liners such as illustrated, have been crushing for several years on very hard materials without ever having been removed from the mantle.

This notable saving results from regularly replacing the RESISTO-LOY just before the abrasion has reached the manganese liner. When such maintenance is carried out, these liners can be fully expected to operate indefinitely. The first application of RESISTO-LOY represents but a fraction of the cost of a new liner.

This application of RESISTO-LOY is a job that can easily be done the first time and repeatedly thereafter by your own plant maintenance welder. There are just a few simple instructions which our field man will gladly discuss with you. Don't overlook this important economy.

THE RESISTO-LOY CO., INC. GRAND RAPIDS 7, MICHIGAN

Consolidated Gold Fields and Central Mining Discuss Merger To Form Giant African Combine

The Consolidated Gold Fields of South Africa Ltd. and The Central Mining and Investment Corporation Ltd. have been holding discussions about a possible merger of the two firms. The advantages of such an arrangement are obvious—a stronger financial position for development of existing and new interests, and a wider diversification of interests through the existing interests now held by each firm separately.

The Consolidated Gold Fields recently absorbed its associate company, Gold Fields Rhodesian Development Company; is the sole owner of its subsidiary, New Consolidated Gold Fields; owns substantial shareholdings in the Free State Saaiplaas Company, north of the Harmony mine; and in Free State Geduld, Harmony, St. Helena, Welkom, and Western Holdings. Other interests include indirect shareholdings in Rustenburg Platinum Mines through Waterval and Union Platinum companies, a colliery shareholding in the Northwestern Free State, and coking coal deposits in Natal. The Consolidated company is also participating with Anglo American Corporation, the British South Africa Company, and Rhodesian Selection Trust, in the exploration of large areas in Northern Rhodesia. It has initiated exploration in Nyasaland, especially for radioactive minerals; has an interest in the Geita mine in Tanganyika, where it is also participating in developing the Kiabakari mine through the Tangold Mining Company. Other interests include holdings in the Western hemisphere and in Australia. The financing, holding, and administrative subsidiary, New Consolidated Gold Fields, acts as local secretaries for the Rhodesian Selection Trust group; and controls such older gold and gold-uranium mines as Robinson Deep, Simmer and Jack, Rietfontein Consolidated, Luipaards Vlei, Sub Nigel; and such younger units as Vogelstruisbult, Vlakfontein, West Witwatersrand Areas, Venterspost, Libanon, West Driefontein, Doornfontein, New Consolidated Free State Exploration, and Free State Saaiplaas; the Waterval and Union Platinum companies; and is substantially interested in Blyvooruitzicht and Western Ultra Deeps, which holds extensive mineral rights immediately south of the Blyvooruitzicht and West Driefontein mines.

Directly through its shareholdings in Rand Mines Ltd., Central Mining and Investment Corporation Ltd. is substantially interested in and controls such other gold mines as Transvaal Gold Minings Estates, Modder East, Rose Deep, East Rand Proprietary Mines, City Deep, Crown Mines, Consolidated Main Reef, and Durban Deep; the younger gold-uranium mines of Blyvooruitzicht and Harmony; Transvaal Consolidated Lands, which has colliery, platinum, chrome, and shareholding interests; Witbank Colliery; the Northern Lime company; Pretoria Portland Cement and Hume Pipes; and shareholdings in St. Helena, Winkelhaak, Western Holdings, and Vogelstruisbult, etc. It also holds substantial interests outside South Africa.

New Copper Concentrator To Aid Irish Production

Construction has started on a 4,000-ton daily capacity copper concentrator in the Vale of Avoca, approximately 40 miles south of Dublin, Ireland. The plant is for Irish Copper Mines Limited, a subsidiary of Mogul Mining Corporation of Toronto, Canada, who has underwritten financing with $7,000,000 5 percent sinking fund debentures.

Excavation work has been completed for the concentrator and five permanent housing units, costing $50,000, are 70 percent completed with progress reported on the erection of the mine dry, machine shop, office, warehouse and other auxiliary structures.

The Irish ore reserves have been established at 21,350,000 tons, averaging 1.13 percent copper, 0.23 percent lead, 0.63 percent zinc, and 8.38 percent sulphur.

In west County Cork the reopened Allihies copper mines are under development by Can-Erin Mining Corporation of Toronto through its subsidiary, Irish Mining Corporation. Five drilling rigs and a quantity of pumping equipment are at work on the various properties of the company.

The heaviest machine, capable of drilling to a depth of 3,000 feet, is being used to put down a deep hole to intersect the high grade copper zone below the deepest workings at the Mountain mine, one of the famous "Hungry Hill" group.

Two surface drills are being used at the Beauparc copper mine, 30 miles north of Dublin and at the Castleblaney group of lead zinc mines. Dewatering operations are progressing rapidly at the Beauparc mine and the Mountain mine.

Hanna Seeks Prospecting Rights in Ethiopia

Latest firm to enter into negotiations with the Ethiopian government is M. A. Hanna Company of Cleveland, Ohio. Representatives of the firm are reportedly interested in long-term exploratory rights over a large area, particularly western Ethiopia near the Sudan border.

Already at work prospecting in the southern part of the country is a team of geologists and mining engineers representing a joint undertaking of Goldfield Consolidated Mines, Newmont Mining Corporation, and Natomas Company.

Ethiopia has been known since classical times for her gold mines. Most important is the Adola placer mine in the valleys of the Awata River. The area was sampled by an Italian company which estimated there were some 2,500,000 cubic meters of placer gravel containing about 2,500 kilograms of gold. The Ministry of Finance has been working this deposit for the Ethiopian government since 1941.

Second most important gold mining region is in the west, bordering the Sudan. An Italian company developed mines at Asosa, Ondonal, Akobo, Gorgoma, Kepi, Bomu, and Nedggio. Placer areas were also explored in the Wombera area of Godjam near the Blue Nile.

There has been some platinum production; last official report around 1944 was 29.30 kilograms. Occurrences of nonprecious metals have been found but these are all mostly undeveloped. Some iron has been noted, but no deposits have seemed large enough to warrant establishment of a metallurgical plant. Traces of manganese, tin, mercury, wolframite, and lead have also been mentioned. Perhaps one of the recent concession grants will prove profitable to both the mining firm and the Ethiopian government.

Philex Exploration Plans New Base Metal Mill

Philex Mining Corporation has taken over the management of the Benguet Exploration Company which has extensive mining claims near Baguio, Mountain Province, Phillippine Islands. Philex plans to build a 50-ton-per-day differential flotation mill on the National Highway near Camp 6 to treat ore from Benguet Exploration's mine. This company and mine were formed and developed in the 1930's. The mine has about 20,000 tons of complex sulphide ore developed, assaying about 1.0 ounce gold, 1.5 to 2.0 percent copper, 15 percent zinc, and 0.5 percent lead per ton. Exploration will continue to develop additional ore.

In addition to the Benguet Exploration ore, Philex has discovered and partially delimited a large low-grade copper ore body not far from the new mill site. Philex plans some selective mining, with high-grade ore to be treated in the new mill.

Paul Schaefer is company president, and George Scholey, vice president. Clarence Weekley, director of Benguet Exploration and consulting metallurgist for Atlas Consolidated Mining Corporation, is doing metallurgical testing and mill design. I. Hidalgo, who supervised mill construction at Atlas Copper, Lepanto Copper, and Itogen Gold, will be in charge of mill construction.

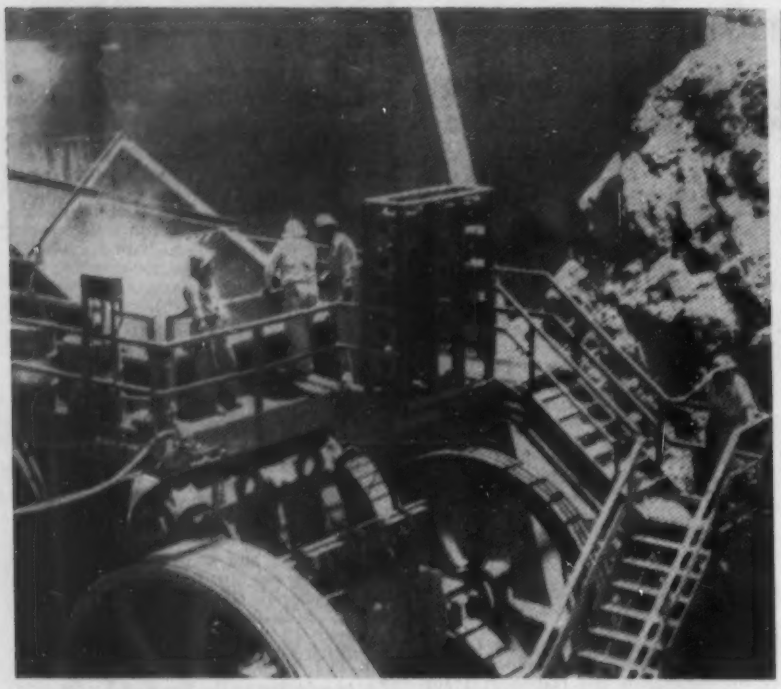
DMEA Borrowing Funds Increased to $34,000,000

The Office of Defense Mobilization has approved a request for $6,000,000 additional borrowing authority for essential projects during the fiscal year 1957, under the Defense Minerals Exploration Administration program. This brings total funds for the program to $34,000,000.

The DMEA was established in November 1951. Its purpose is to encourage exploration for indicated or undeveloped sources of critical and strategic minerals by furnishing financial aid to private enterprise on a participating basis of either 50 or 75 percent of the costs of an approved exploration project, depending upon the mineral sought.

The government will pay 75 percent in the case of antimony, asbestos (chrysotile only), beryl, cobalt, columbium, corundum, diamonds (industrial), kyanite (strategic), manganese, mercury, mica (strategic), monazite and rare earths, nickel, platinum-groups metals, quartz crystal (piezo-electric), rutile-brookite, selenium, talc (block steatite), tantalum, thorium, tin, tungsten, and uranium.

The minerals for which the government will share 50 percent of exploration costs are bauxite, chromium, copper, fluorspar, graphite (crucible flake), lead, molybdenum, zinc, and cadmium.



Mines get Low-Cost Dust Control with Johnson-March systems

Mine operators find the cost of a J-M liquid dust control system amazingly low, yet highly effective through careful engineering by qualified dust control specialists. Handling of ores, coal, coke, rock, etc., can be dust-free. Dust is stopped at the source . . . crushers, conveyors, screens, loading and unloading bins, elevators . . . wherever needed.

HIGH EFFICIENCY WET SCRUBBING

Collection of all types of dust, including sub-micron particles, and recovery of valuable materials are handled efficiently and economically. The Johnson-March Type A Hydro Precipitator Scrubber can provide efficiencies as high as 99% plus.

Perhaps your dust problem is a special one, then our engineers can design a system for you . . . or perhaps we've already solved a problem like yours. You'll find our experience valuable whatever your operation. For an obligation free analysis of your dust problem write . . .

Johnson March

Dust Control Engineers

1724 CHESTNUT ST., PHILADELPHIA 3, PA.

CANADIAN REPRESENTATIVES: G. F. Sterne and Sons, Ltd., Brantford, Ontario

INTERNATIONAL

U.S.S.R.—The Central Statistical Board of U.S.S.R. reports that production of copper, aluminum, nickel, tin, and rolled non-ferrous metals reached 102 percent of the goal set for the first half of 1956. Output of pig iron increased 9 percent during this period, steel increased 8 percent, and rolled metal increased 7 percent. The report also tells of plans underway for 3,500 large industrial enterprises of ferrous and non-ferrous metallurgy, machine building works, and five new hydro-power stations. The sixth Five-Year Plan, inaugurated early this year, stated the need for 1,000,000 workers in northeastern Russia's metal industries. The Board reports that more than 1,000 people have already migrated to this region.

FRANCE—Iron ore production for the first half of 1956 reached 26,665,800 metric tons, an increase over the 24, 971,-000 tons for the same period in 1955, and 21,641,000 for January-June 1954. Output for June totaled 4,777,400 tons compared with the 4,138,200 tons in May. Half-year export figures show an increase from 6,553,000 tons for the first half of 1955 to 6,818,000 tons in the same six months of 1956. The principal buyer, the Belgium-Luxembourg Economic Union, increased purchase from 968,200 tons in May 1956 to 1,117,700 tons in June.

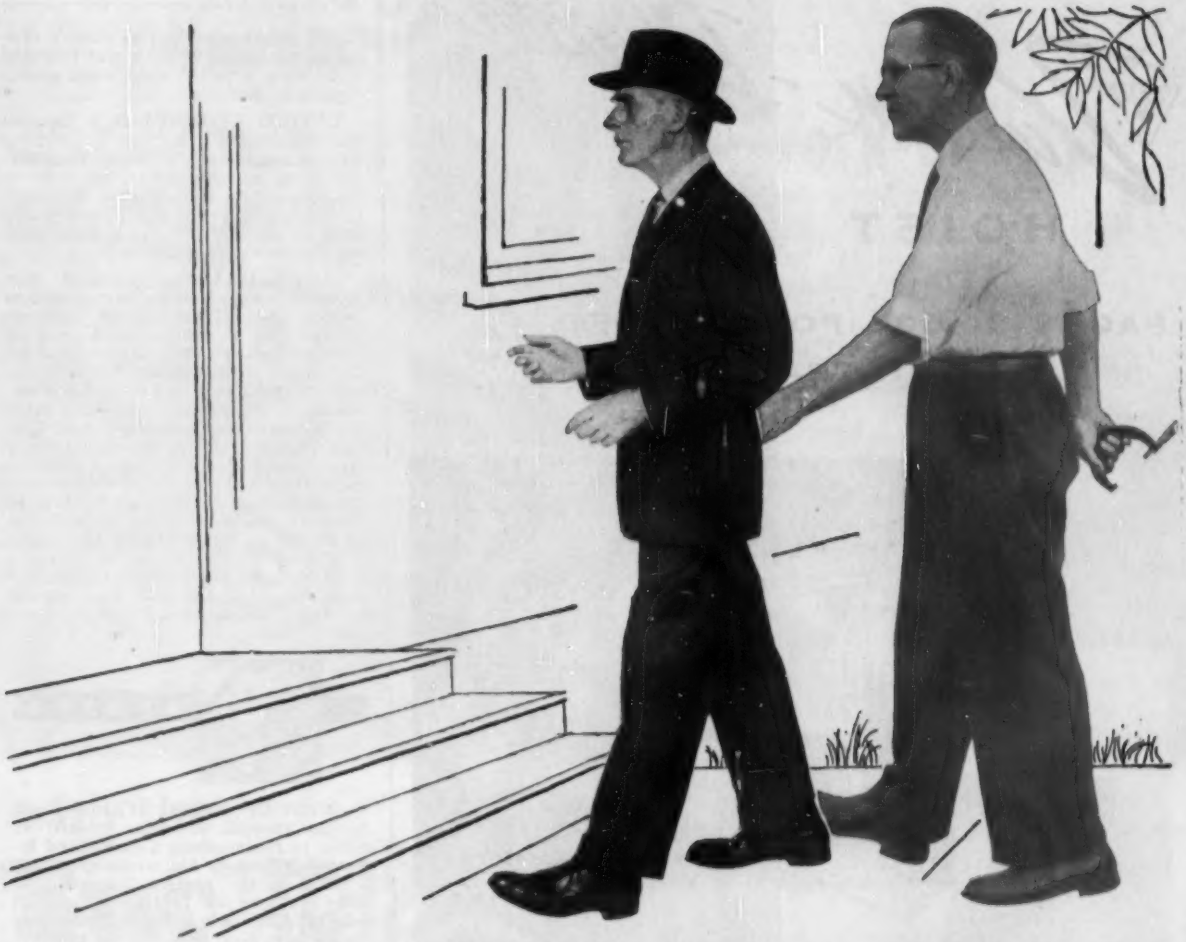
NORWAY—A production goal of 100,-000 tons of lead ore a year has been set by the newly organized *Bleikvassli Mining Company* in northen Norway. A flotation plant is under construction.

SCOTLAND—A concentrated granular fertilizer plant is being built at Leith, Scotland by *Scottish Agricultural Industries Ltd.* The total cost will be about $8,500,000, which includes installation of three main units—sulfuric acid, phosphoric acid, and a formulation and granulation plant designed by Dorr-Oliver Incorporated—and reconstruction of an existing fertilizer plant. Production in the sulfuric acid unit began in August and the other two units are near completion.

BULGARIA—Rich deposits of copper, lead, and zinc have been discovered in the Stara Planina Mountains near Vratza in northwest Bulgaria. The *Bor* copper mines are just over the nearby Yugoslav border.

BELGIUM—The *Belgian Aluminum Syndicate* has been formed in Brussels to investigate the possible formation of a Belgian aluminum producing industry and the building of an electrolytic production plant in the Lower Congo in conjunction with the government's hydro-electric program there. Syndicate members are the *Societe Generale De Belgique*, the *Union Miniere du Haut Katanga*, the *Societe Industrielle del l'Aluminum* (S.I.D.A.L.), several small colonial groups, the "Electrobel," and the Banque De Paris et des Pays Bas.

IRELAND—Two Canadian companies, *Mogul Mining Corporation* and *Explorers Alliance*, have jointly purchased the *Wicklow Mining Company* in Ireland. They plan to expand operations and add a flotation mill at the 40,000-acre lead-zinc-copper-silver property 30 miles southwest of Dublin. The Wicklow mine



Your Wickwire Rope Distributor and our die maker... ready to serve you

This die maker—one of the skilled technicians responsible for the quality of our rope wire—is with your Wickwire Distributor every time he makes a call.

True, he's physically in our plant, working to tolerances of 1/10,000 of an inch as he fashions the super-hard carbide dies used to produce every foot of rope wire. But, whenever your Wickwire Distributor makes his call, he has the full assurance that *every* wire in the product is exactly the size it should be and has a smooth, silky surface finish. This careful attention helps assure a rope which will perform successfully.

It's just one more reason why your Wickwire Distributor knows he's got top-quality rope, slings and strand to sell . . . and that these products will serve you well.

CF&I WICKWIRE ROPE A CF&I PRODUCT

4083

A PRODUCT OF THE COLORADO FUEL AND IRON CORPORATION

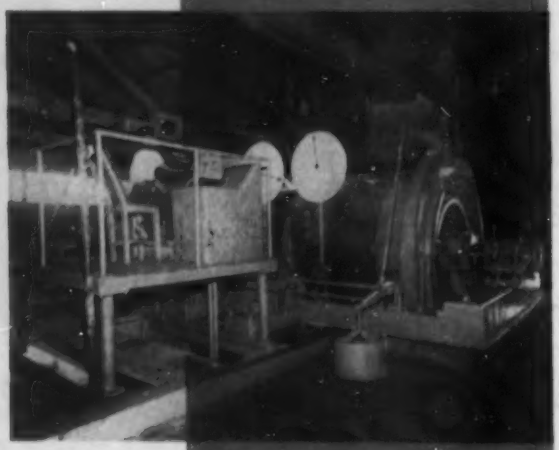
THIS

Vulcan-Denver

HOIST

PACKS 30,000 POUNDS OF

"BOOTSTRAP"



In the Philippines, or anywhere their operations call for rugged mine hoist equipment, first choice is a Vulcan-Denver. Double-drum hoists like this 30,000 lb. capacity unit of the Philippine Iron Mines are operating in most of the mining regions of the world. We will gladly send you a list of nearby installations.

Observe the smooth operation of this hoist, check the low maintenance requirement and operating economy; examine for yourself the rugged design and safety features always present in a Vulcan-Denver. Our engineers are at your service to solve your special hoisting or slushing problem. Hoists available as low as 2,000 lb. rated rope pull. Choice of power and features in single and double drum units.

Write for details

VULCAN IRON WORKS CO.

1423 STOUT STREET

DENVER 2, COLORADO

was in operation in the 19th century, closing down around 1879. It was reopened in 1950 on a limited scale, using gravity separation methods.

UNITED KINGDOM—It is reported that *Huntington, Heberlein & Company Ltd.*, a member of the *Simons Engineering* group, has acquired certain rights to the Stripa dense media process, developed in Sweden where it has proved to be both an efficient and simple installation for the treatment of iron ores.

YUGOSLAVIA—The aluminum plant at Kidricevo in Slovenia is expected to produce about 1,000 tons of aluminum by the end of 1956. Operations have only been normal since May with about 140 to 150 wells working. Earlier in the year all of the cells had been shut down because of winter power shortages. Plans are currently being discussed with German, Russian, and other experts for a great expansion of water power and aluminum production facilities. Present production level of 15,000 to 20,000 tons of aluminum per year should be increased to 100,000 to 200,000 tons. The plants at Kidricevo and Lozovac in Dalmatia should be enlarged, the Razine (Dalmatia) plant completed, and new plants erected in Mostar (Bosnia) and Niksic (Montenegro).

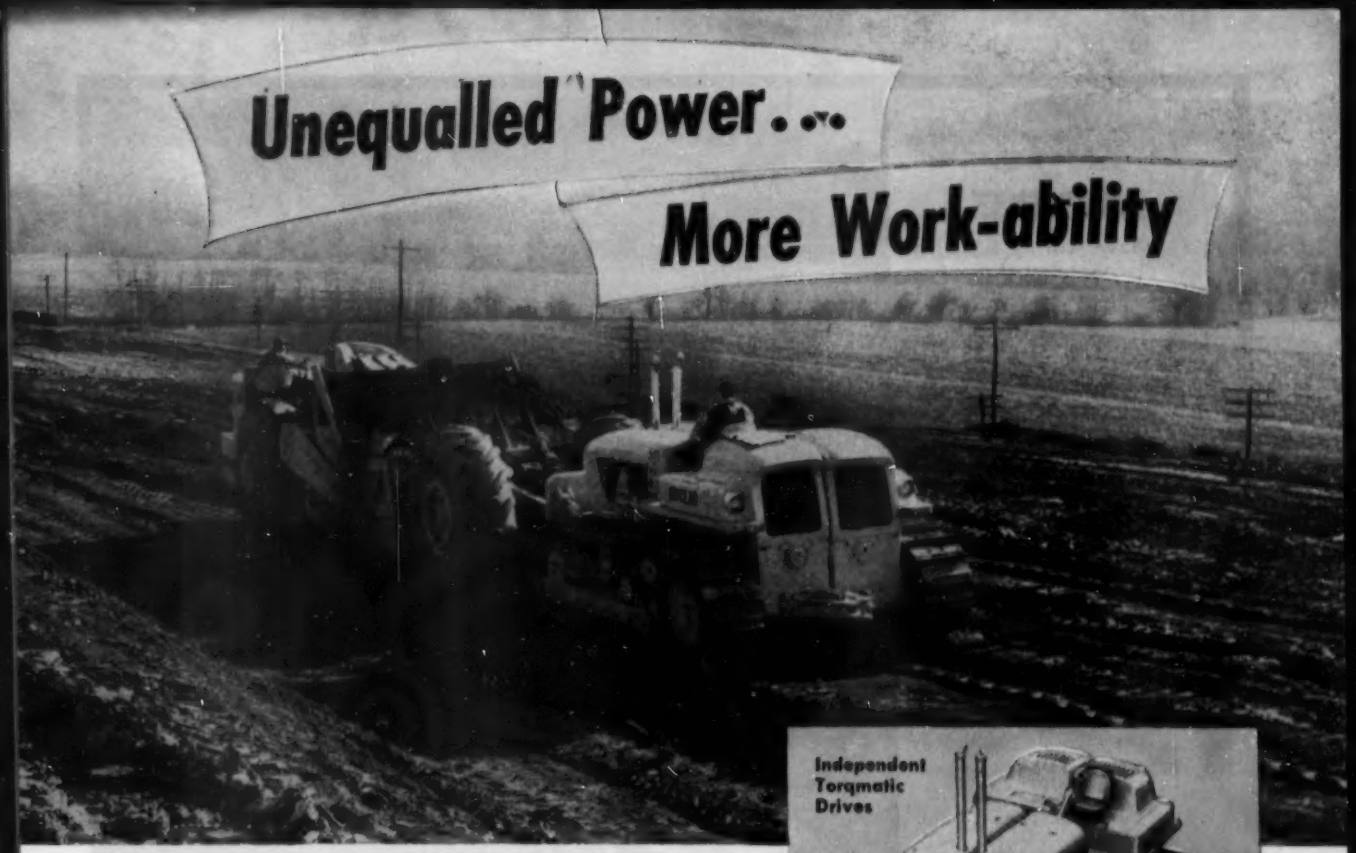
AFRICA

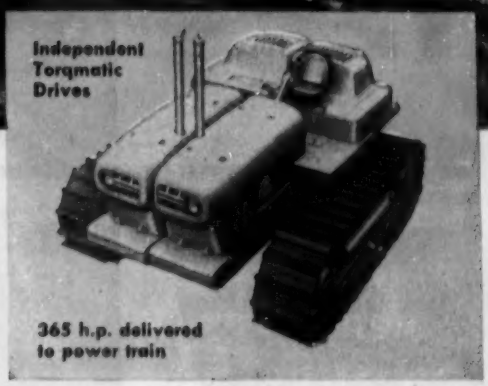
UNION OF SOUTH AFRICA—*South African Minerals Ltd.* has granted an option to *Johannesburg Consolidated Investment Company Ltd.* to survey mining activities in the western Transvaal, 37 miles northeast of Rustenburg and 18 miles from Boshoek. Extensive outcrops of chrome have been traced on the property and several seams dipping at low angles have been opened up to moderate depths. Considering the potentialities of this deposit, development, so far, has been comparatively low. The company's mineral rights also cover an area where nickel-copper gossans are found outcropping but little or no work has been done in recent years to further investigate the potentialities of these ore bodies. This is not the first time the Johannesburg Consolidated Investment Company has taken an interest in the Western Tranvaal chrome mines. During 1947 the firm acquired control of *Palmiet Chrome Mines Ltd.* but dropped the project a few years later.

FEDERATION OF RHODESIA AND NYASALAND—*Bancroft Mines Ltd.*, which reports satisfactory progress in opening up its two ore bodies in the six-month period ended June 30, 1956, also reports the location by drilling of a large additional area underlain by ore at shallow depth, south of No. 1 shaft. The metallurgical plant is being erected.

NIGERIA—Activities of *Mines Development Syndicate (West Africa) Ltd.* in Nigeria are now conducted by the *Nigerian Lead-Zinc Mining Company Ltd.* The company continued active development on the 150- and 250-foot levels at *Ameri* last year in order to prove ore reserves already indicated by diamond drilling from the surface. This work is now largely completed and it is expected that the necessary steps for equipping the

Unequalled Power...
More Work-ability





with the
"Euc" TC-12
Twin Crawler Tractor

Here's a completely new concept of tractor design and performance... the TC-12 Twin-Power Euclid. It's designed and built to deliver more power, easy operation and greater work-ability—plus exceptionally fine accessibility for servicing. Power train components are matched and job proved with years of dependable performance in heavy earth moving equipment.

Powered by two 194 h.p. engines with separate Torqmatic Drives, the TC-12 gives a smooth, steady flow of power to meet every job requirement. There's no master clutch and no manual gear shifting. Three speed ranges in forward and reverse are available by simply moving a selector lever... top travel speed is 8.3 m.p.h. The TC-12 has good stability and traction on rough ground because each half of the tractor is separate and free to oscillate ... the two halves can be easily separated for shipment. Write for detailed specifications.

EUCLID DIVISION, General Motors, Cleveland 17, Ohio

Tremendous power, speed and maneuverability make the TC-12 a top performer in heavy duty mine and quarry work. No other tractor matches its production in stripping overburden, clearing, stockpiling, building haul roads, and other big tractor jobs.

For lower cost per ton or yard ...
Euclids are your best investment

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

Digs MORE

At Mohave Mining & Milling Co.'s sintering plant the powerful break-out action of the model HU "PAYLOADER" works the bucket into tough, heavy ore and tips it back 40° at ground level to get bigger loads, with less spillage.

Carries MORE

The heaped load is cradled close to the machine for greater stability and can be carried at lower level. Exclusive load shock-absorber cushions the load during travel, smooths out the ride and permits faster movement with less spillage.

Delivers MORE

Because the "PAYLOADER" gets MORE to begin with and carries MORE while traveling at higher speeds . . . with less spillage in both instances . . . the result—you deliver MORE. "PAYLOADER" design handles more yardage at lower cost.

More Productive Capacity

Whether you want to move manganese ore like this, or larger-size ore and rock, "PAYLOADER" tractor-shovels are designed to get and hold bigger loads and deliver them faster.

"PAYLOADER" superiority on materials handling at mine, mill and smelter is the result of 34 years of pioneering and leadership in tractor-shovel manufacture. "PAYLOADER" preference in the mining industry also comes from the fact that "PAYLOADER" is a complete proven line—there's a size and type to best meet each need—PLUS the finest parts and service facilities at the nearby "PAYLOADER" distributor.

PAYLOADER®

MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

THE FRANK G. HOUGH CO.
859 Sunnyside Ave., Libertyville, Ill.

Send "PAYLOADER" information as follows:

- ☐ Front-wheel-drive — to 1 cu. yd.
- ☐ Rear-wheel-drive — to 1½ cu. yd.
- ☐ Four-wheel-drive — to 2¼ cu. yd.

Name _____

Title _____

Company _____

Address _____

City _____

State _____

property for production can soon be started.

FEDERATION OF RHODESIA AND NYASALAND—*Cullinan's* corundum mine has reopened and is operating on a 500-ton-per-month basis. Quarrying of the unique massive corrundum deposit near Concession in Southern Rhodesia has resumed. For some time the property has been on a care and maintenance basis pending exhaustive trials of the refractories which have been manufactured from the corundum.

UNION OF SOUTH AFRICA—The *Buffelfontein Gold Mining Company Ltd.* has completed its first phase of shaft sinking for the first stages of production, and is scheduled to initiate trial milling toward the end of this year. To June 30, 1956, 2,395 feet had been sampled on the Vaal Reef horizon, the major economic reef of the lease area, and the program had indicated reasonable consistency of Vaal Reef values throughout the lease area. Development is being carried out in the northwestern section of the lease area, where the twin-shaft system is situated.

CAMEROONS—Initial production is expected from the new $37,000,000 aluminum plant under construction at Edea by the end of December. Work on this project has been underway since 1955 by *Campagnie de l'Aluminium Pechiney-Ugine (Alucam)*. This firm was organized as a subsidiary of *Pechiney Company* and the *Electro Metallurgie d'Ugine Company*, which, between them, produce virtually all of France's aluminum. Operation at full planned capacity will be 45,000 tons of ingot and plate but this is not expected to be attained before mid-1958. Hydroelectric power will be supplied by generating facilities under construction at Sanaga Falls on the Sanaga River. Initially, French mined bauxite will be converted to processed alumina for shipment to the Edean Works; later bauxite will be shipped from the New Guinea mines.

TANGANYIKA—The program of development being carried out at the property of *Geita Gold Mining Company* under a £100,000 loan by *New Consolidated Gold Fields Ltd.* will now be stepped up. Additional financing (£175,000) has been worked out by New Consolidated with *Kentan Gold Areas Ltd.* where each will provide half of the money. Development work on the third level of the North-East extension has shown values ranging between 4.8 and 5.9 dwts. of gold over a reef width of up to 29.6 feet.

BECHUANALAND PROTECTORATE—The administration of the Territory is embarking on an extensive program to develop its underground water supplies. *De Beers Consolidated Mines Ltd.* is continuing its investigation of the *Tuli Block*. This company has an exclusive right to develop diamond deposits throughout the Territory.

UNION OF SOUTH AFRICA—The drive advanced from the *Venterspost* mine 1,910 feet into the property of the *Middlevlei Estate and Gold Mining Company Ltd.* has disclosed low values on the Venteesdorp Contact Reef horizon, 3 to 40 inch-dwts., and operations have been suspended. At a later date, the investigation of the property may be resumed from the outcrop zone in the northern section of the property. The company has now acquired a five percent interest in a section of 829 claims incorporated in

acker

TEREDO CORE DRILL

"Best in the West for Uranium Testing!"

Acker Teredo Core Drills operating on the Colorado Plateau have already "been-in" on some of the biggest uranium strikes in the West!

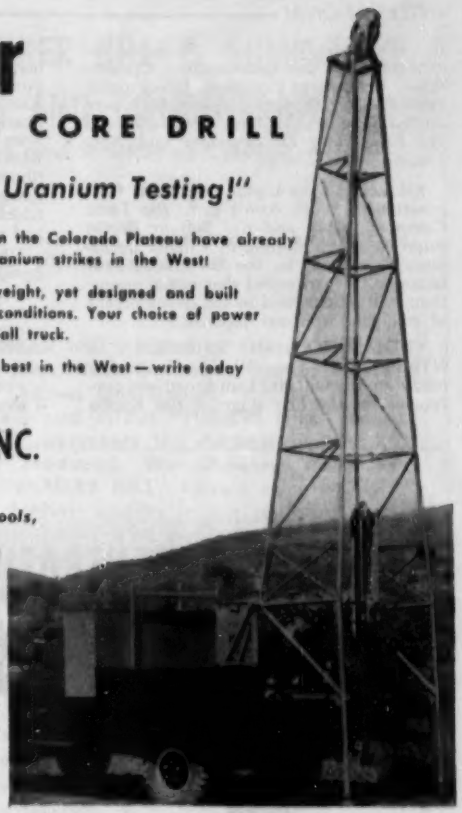
There's a reason! They're lightweight, yet designed and built to stand-up under the most rugged conditions. Your choice of power plant and mounting on trailer or small truck.

Make us prove that Acker's the best in the West—write today for Bulletin 30 MW!

ACKER DRILL CO., INC.

SCRANTON 3, PENNA.

a complete line of Soil Sampling Tools, Diamond and Shot Core Drills, Drilling Accessories and Equipment



Here's one of the portable, self-contained Acker Teredo Drills already in use on the rough, remote terrain of the Colorado Plateau. A built-in water supply tank permits this rig to operate anywhere!

get more earning power with...

Greensburg storage battery locomotives

5 TON HIGH TYPE MONITOR

Available in 3 to 12 tons: 42 to 48" high, 18 to 56½" track gauges.

Greensburg's dependable performance results in operating economy. Advanced engineering design and custom-building to specifications give Greensburg Locomotives up to 20% more efficiency and longer battery life than any other storage battery locomotive of equal weight and battery capacity. More earning power per dollar invested!

Built in single or double motor drives with double equalizers, drum or contactor type controllers, with or without dynamic braking, Greensburg Locomotives will haul more and cost less to operate!

Send us your haulage problem today!

GREENSBURG MACHINE CO.

110 Stanton Street
GREENSBURG, PA.

the *Waterpan* block currently being investigated by the *Johannesburg Consolidated Investment Company*. Other participants in the Waterpan operations where encouraging results have been obtained are *Free State Development* and *New Union Goldfields*.

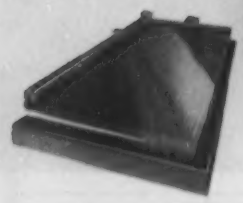
SWAZILAND—*Anglo American Corporation of South Africa Ltd.*, *Rio Tinto Company, Ltd.*, and the *Balfour Beatty* interests are combining in a major development scheme in the Swaziland Protectorate. It is expected that initial operations will be confined to the development of coal and iron ore deposits.

FEDERATION OF RHODESIA & NYASALAND—The World Bank has made an $80,000,000 loan in various currencies for the first stage of the Kariba hydroelectric power project. The loan will help to finance building of a dam and power with 500,000-kw. capacity at Kariba Gorge on the Zambesi River, and nearly 1,000 miles of transmission power lines to the copper belt in Northern Rhodesia and principal cities in Southern Rhodesia. The loan was made to the newly created Federal Power Board which will be responsible for construction and operation.

UNION OF SOUTH AFRICA—*Harmony Gold Mining Company Ltd.* has completed the installation of the permanent hoists and headgear and of sinking equipment at the No. 2 shaft. Full-scale sinking concurrent with lining and equipping should now be underway. This shaft is about 5,500 feet northwest of the No. 3 shaft.

WILFLEY CONCENTRATING TABLE

many profitable applications in modern metallurgy



No. 6 Wilfley Table with variable speed V-Belt motor drive.

No. 11-D Wilfley Table showing concrete foundations.

No. 12 Wilfley Table with variable speed V-Belt motor drive.

No. 13 Spec. Wilfley Table with overhead Lamp, as Flotation Pilot Table.

The **genuine WILFLEY TABLE,** as manufactured by Mine & Smelter, has been an important factor in the success of many metallurgical processes for years. There are still many applications where the Wilfley Table is of particular value and cannot be equalled for economical and efficient performance. Some of these are...

- **Before or after flotation for recovery of mineral not readily recovered by flotation.**
- **As pilot tables following flotation to indicate efficiency of flotation.**
- **To concentrate low grade mineral producing a high grade concentrate for further treatment.**
- **To wash and clean inferior coals, iron ore, etc.**
- **In metal and reclamation plants.**
- **For two or more mineral separations from flotation concentrates, previous table concentration or from original table feed.**

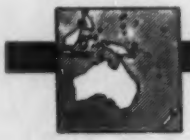
The Wilfley Table has an easily adjustable stroke from ⅝" to 1", a speed range from 240 to 300 strokes per minute, an adjustable table inclination from zero to 1" per foot, and a selection of wood riffles of various depth and taper...all of which permit a flexibility to best meet the conditions of each application.

WRITE FOR CATALOG

The Mine & Smelter Supply Co.

DENVER • SALT LAKE CITY • EL PASO • NEW YORK

Representatives in Foreign Countries



QUEENSLAND—*Australasian Oil Exploration Ltd.* will soon need to change its name. Leases on beaches on the south Queensland coast are stated to contain up to £15,000,000 worth of rutile. These areas were recently purchased from Clive Foyster who is supervising erection of a plant at Mermaid Beach. The plant will cost £200,000 and will begin production of spiral concentrates within two months. Concentrates will be stockpiled until December when separation of rutile and zircon will begin. Rutile production rate is estimated to be 12,000 tons per year by March 1957, putting A.O.E. in the first four or five producers in terms of output. It is hoped ultimately to produce 20,000 tons per year. Initially, sands treated will carry 8 to 15 percent of heavy minerals. Leases extend up to three miles inland where raised beaches occur.

REPUBLIC OF THE PHILIPPINES—*Palawan Quicksilver Mines Inc.* started its second 80-ton-per-day furnace at Palawan, Philippine Islands on July 10th. Gordon I. Gould, internationally known quicksilver specialist and manufacturer of the plant, was in the Philippines for the start-up. Palawan production in June was 204 flasks of ore from the first 80-ton-per-day unit installed in 1955. July production was 277.5 flasks from the No. 1 kiln and partial operation of the No. 2 kiln.

WESTERN AUSTRALIA—The London-controlled *Siamese Tin Syndicate Ltd.* is testing the Greenbushes leases of *Tin and Strategic Minerals Ltd.* with a view to taking a substantial interest in them. If Siamese Tin is satisfied with its testing it will take up an option until next January to subscribe for 1,600,000 shares. It has a further option to take up 400,000 shares over five years. The introduction of £100,000 by Siamese Tin, if the merger occurs, may enable the Greenbushes area to be worked on a scale comparable to that of other important tin fields.

NEW GUINEA—*Bulolo Gold Dredging Ltd.* shows a further drop of about a third in gold output for the year ended May 31, 1956. Production was 40,134 ounces. The company is turning to development of timber concessions on an increasing scale.

INDONESIA—In the Tjikotok district of west Java, the *Tjirotan* mine has been reopened and prewar installations are being rehabilitated. The gold- and silver-bearing sulphides will be subject to flotation and cyanidation. Production is expected to start at 100 tons per day, increasing to 150 tons per day at a later date. The ore reportedly contains 25 grams Au and 120 grams Ag per ton.

QUEENSLAND — *Consolidated Zinc Corporation* reports discovery of extensive deposits of bauxite on the western side of Cape York Peninsular. It is too early to assess the deposits but indications are that there are commercial quantities of high grade. Coupled with earlier discoveries of high-grade bauxite on Wessel Island, off the north-eastern Northern Territory, and other deposits in Arnhem Land, Northern Territory, it appears that

MAGMA
COPPER COMPANY

Buyers of

COPPER, GOLD

AND SILVER ORES

MINES AND SMELTER AT

SUPERIOR, ARIZONA

BUNKER HILL & SULLIVAN
MINING AND CONCENTRATING CO.

Mines and Smelter at Kellogg, Idaho

Buyers of:

Lead ores and concentrates, zinc concentrates, silicious gold ores.

Sellers of:

"BUNKER HILL" brand of refined Pig Lead, Slab Zinc, Cadmium crude Antimonial Lead and Leaded Zinc Oxide.

We are proud of our "BUNKER HILL" trade mark. It represents the highest quality of metals produced. We likewise strive to make "BUNKER HILL" known as a symbol of the highest quality in our relations with our employees, with our suppliers of ores and concentrates, with our stockholders and with the general public.

For information regarding ore rates and shipments Address:

BUNKER HILL SMELTER
Box 29
Kellogg, Idaho

International
Smelting and Refining Co.

ANACONDA
from mine to consumer

Buyers of

Copper, Silver & Gold
Ores and Concentrates:

Copper Smelter—Miami, Arizona
Address: Ore Purchasing Department
International Smelting and Refining Co.
P. O. Box 1265
Miami, Arizona

Lead & Zinc Ores
and Concentrates

Lead and Lead-Zinc Smelter, Lead-Zinc Concentrator } Tooele, Utah

Address: Ore Purchasing Department

International Smelting and Refining Co.
818 Kearns Building
Salt Lake City, Utah

Please establish contact prior to shipment.

AMERICAN ZINC, LEAD AND SMELTING COMPANY

Buyers of Zinc Concentrates Suitable for Smelting in Retort and Electrolytic Smelting Plants, also Buyers of High Grade Lead Concentrates.

Address Communications to Ore Buying Department

Paul Brown Building
ST. LOUIS, MISSOURI

423 Mills Bldg.
EL PASO, TEXAS

927 Old National
Bank Building
SPOKANE, WASHINGTON

P.O. BOX 577
DUMAS, TEXAS

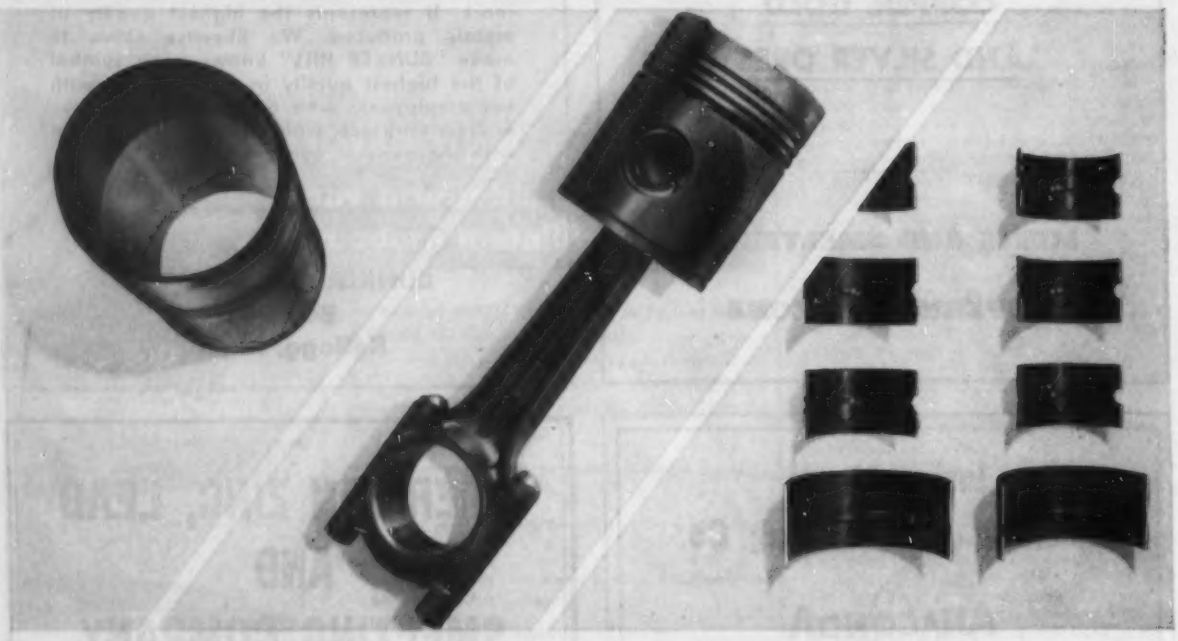
The Engineer's Field Report

CASE HISTORY

LUBRICANT RPM Delo Oils

FIRM Progressive Transportation Co, Compton, California

RPM DELO holds piston wear to .001" after 201,253 miles of on-and-off highway hauling



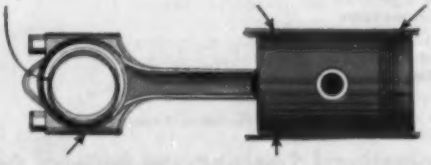
LUBRICATED WITH RPM DELO Oil, these engine parts were pulled from a Cummins HR diesel after 201,253 miles. A portion of this mileage was put on during four months of rugged service spotting loads of heavy pipe in the Arizona desert. When the engine was taken down, after two years of this on- and off-highway hauling, Progressive Transportation Co. found RPM DELO Oil had kept lacquer, gum, sludge, and deposits from forming...rod bearing wear varied between .0005 and .001 inch and pistons showed maximum wear of only .001". No wear at all evident on main bearings. Progressive Transportation uses RPM DELO Oils in all its large fleet of tractors—some of which have traveled well over 200,000 miles without overhaul.

Why RPM DELO Oils prolong engine life

Special compounds stop corrosion

Anti-oxidant resists lacquer formation

Detergent keeps all parts clean



Metal-adhesion qualities keep oil on parts in running or idle engines—inhibitor resists foaming

LUBRICATING OILS RPM DELO

For More Information... about this or other petroleum products of any kind, or the name of your nearest distributor, write or call any of the companies below.

STANDARD OIL COMPANY OF CALIFORNIA,
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY,
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

there could be considerable development in the Gulf of Carpenteria.

TASMANIA—*Rio Tinto (Australia) Explorations Pty. Ltd.* will be joined by *The Electrolytic Zinc Co. of Australasia Ltd.* and *The Mount Lyell Mining and Railway Co. Ltd.* in exploring the west and north-west coast of the island. A license to prospect covers the area from Queenstown to the north coast and westward of a line which is slightly east of Queenstown.

REPUBLIC OF THE PHILIPPINES—*Marinduque Iron Mines Inc.* has shipped 5,500 tons of high-grade copper ore to Japan from its *Bagacay* deposits on Samar. The ore in the shipment was reported to average 18 to 20 percent copper content. The company has a stockpile of some 20,000 tons of high-grade ore which it expects to finish shipping by the end of the year.

NORTHERN TERRITORY—Fifty tons of high-grade pitchblende in barrels are en route to the United States from *United Uranium's El Sharana* mine at South Alligator River. This is believed to be the world's biggest single export of unprocessed pitchblende ore. No statement of values will be made until all documents are completed. The company has purchased a concentration plant from Tennant Creek for £15,000. The Federal Government is closely observing progress in the South Alligator River area but it is leaving the companies there to prove sufficient ore for a uranium oxide extraction plant. A plant will probably be built by the Government, or suitable arrangements will be made, if sufficient ore reserves are proved. At June 30, United Uranium had proven reserves of 89,140 tons of average value 0.54 percent U_3O_8, equivalent to 12.09 pounds per ton of oxide.

REPUBLIC OF THE PHILIPPINES—*Atlas Consolidated Mining and Development Corporation* reports that its total sales of copper and gold from January through June 1956 were Pesos 9,898,828, from which a net profit of Pesos 4,312,523 was realized. *St. Gobain, Chauney and Cirey* is currently designing the Atlas acid fertilizer plant which is to start production in early 1958. The firm has the contract for engineering design, engineering supervision, and supply of machinery and equipment.

NEW BRUNSWICK—The *Anaconda Company (Canada) Ltd.*, a wholly owned subsidiary of the *Anaconda Company* in Butte, Montana, has five diamond drills at work on a major base metal prospect 30 miles west of Bathurst. Two zones of massive sulphides have been outlined, each over 1,000 feet long, with widths varying from 15 feet to 115 feet. The ore is copper-lead-zinc-silver. W. T. Swensen is assistant vice president of the Canadian firm; Dr. C. C. Cheriton is in charge of the prospecting work. He has established an office in Bathurst.

NEW YORK—*Molybdenum Corporation of America* reports it is now processing and selling ferro columbium. The government stockpiling of columbium was recently completed and this metallurgical alloy is now available for commercial use in unlimited quantities. The firm holds property at Oka, Quebec which it reports to be one of the largest columbium deposits in the world. An ample supply is on hand for future requirements.

BRITISH COLUMBIA—*Climax Molybdenum Company* is reported to have taken an option on 103 claims in the Caribou district from a syndicate headed by H. H. Heustis. The property is said to contain molybdenum.

ALASKA—*Yuba Manufacturing Company* has completed the new dredge for *United States Smelting, Refining and Mining Company* at Nome. Some machinery and parts from a dredge that capsized in the spring of 1953 were used.

ONTARIO—*El Sol Gold Mines Ltd.* has optioned 112 claims from *Newkirk Mining Corporation Ltd.* in northwestern Ontario about 65 miles northwest of Sioux Lookout and about 45 miles east of *Iron Bay Mines Ltd.* This, too, is an iron ore prospect which showed up extremely well in an airborne geophysical survey. The company is now constructing a camp, while conducting surface sampling and diamond drilling.

QUEBEC—*Copper Cliff Consolidated Mining Corporation* has collared its new shaft on the west side of Merrill Island at Dore Lake and is planning to sink a three-compartment shaft to a depth of 650 feet after the head frame is erected. The shaft will be used to explore for a copper zone indicated by surface diamond drilling.

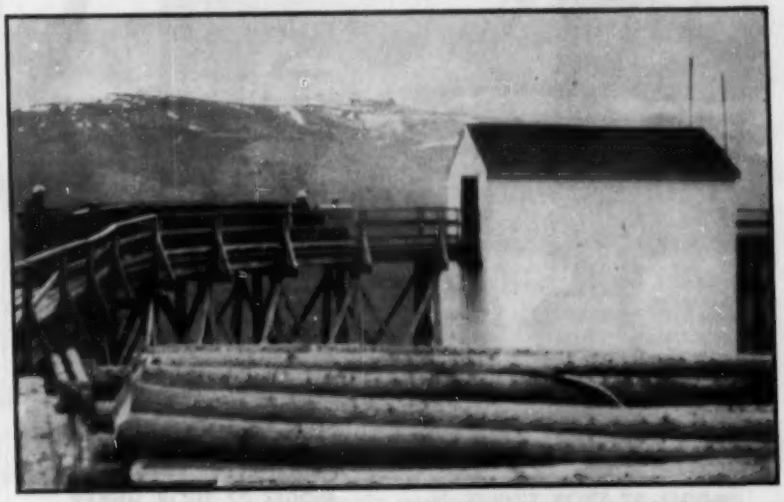
NEW BRUNSWICK—Diamond drilling is now underway by *Fundy Bay Copper Mines* on some of its claims in the Nerepis area about 22 miles north of St. John, New Brunswick, and aerial electromagentic survey work is being completed on four groups in the Newcastle area.

BRITISH COLUMBIA—*Canam Copper Ltd.* has started construction of a 2,000-ton ore crushing mill at its property 125 miles east of Vancouver. Cost is estimated at $2,500,000, with ore reserves listed at more than 3,000,000 tons. *Mogul Mining Corporation* took over financing and management a year ago.

QUEBEC—A full-scale investigation is being made of the properties of *Oceanic Iron Ore of Canada Ltd.* near Ungava Bay by the company's management, *Rio Tinto Mining Company of Canada*. The present schedule provides for completion of the field program in September; testing in December; estimates or reports from each of the consultants by early January 1957. Then a decision will be made regarding development of a mine. Mapping and drilling in 1955 indicated a reserve of 275,000,000 tons of ore on one section of the iron formation, grading overall 32 percent iron. A second ore body had not yet been mapped or drilled.

SASKATCHEWAN—A Birdsboro-Buchanan jaw chusher was shipped recently to the *Lorado Uranium Mines Ltd.* operating in the Beaverlodge area. Lorado will use the crusher to process its own uranium ore and to carry on special contract work for other uranium mines in the area. The company expects to mill 750 tons of uranium ore per day, and more with later expansion.

BRITISH COLUMBIA—*Empire Development Company Ltd.* will spend an estimated $3,000,000 in production prepara-



Mackeno Operates Ag-Pb-Zn Mine in Yukon

Mining operations resumed in July at the Mackeno Mines Ltd.'s high-grade silver-lead-zinc mine at Keno Hill, Yukon Territory. The picture above shows an ore train approaching the top of an ore bin. The Mackeno mine is one of the underground mines furthest north in Canada; only Eldorado Mining and Refining Limited's Great Bear Lake mine is north of the Keno camp. Mill production was originally planned at 125 tons a day with a grade of 37 ounces silver per ton. This has been surpassed by the present rate of 130 tons per day with a grade of 41 ounces silver per ton. Mill feed is being drawn mainly from ore developed between the 3rd and 4th levels, with some coming from the 1st level where tonnage still is being expanded. The new 5th level south drive has just recently entered the zone of favorable quartzites and is in ore. This level will be continued southward to its junction with the Sime vein, a distance of 550 feet. Apart from the underground program and gearing for mill production, the company is planning surface exploration in the area of the McLeod and Sime veins junction 150 feet above the 1st level, and the Sime extension 150 feet below the adit level. Presently known ore reserves can keep the mill in operation for over a year.

tions at the Vancouver Island iron ore deposit of *Quatsino Copper-Gold Mines Ltd.* Japanese steel interests have contracted to buy 1,380,000 tons of the ore over three years. *Empire Development* is owned jointly by Quatsino and *Mannix Ltd.* J. Cowan Adam is president of Quatsino.

BRITISH COLUMBIA—A copper discovery high on Swansea Mountain in the Windermere area is being developed by *Midwest Copper Company.* A. G. Pentland is consulting engineer.

ONTARIO—A $600,000 underground development program is being undertaken by *Arcadia Nickel Corporation* on its nickel-copper-platinum property in southwestern Sudbury. The program, designed to provide a new production shaft and to accelerate opening up of known ore bodies, will take about 12 months to complete. Two additional compressors are being installed to permit driving of five headings simultaneously while the headframe over the existing shaft is being enlarged and a heavier hoist installed to handle the increased flow of material underground. Immediate development objective is to drift out the Robinson ore body on the 350-foot level to a point 900 feet east of the existing shaft where a raise will be driven to surface. A similar program will be carried out from the 650 and 950 levels and then the shaft will be widened to three compartments to provide an entirely new production opening from the bottom horizon to the surface. The latter will be known as No. 2 shaft.

LABRADOR—The first international rail shipments of iron ore from the Knob Lake deposits near the Labrador-Quebec border were made in August when a 70-car train hauled 6,000 tons; destination was the *Youngstown Sheet & Tube Company* at Youngstown, Ohio. The $250,000,000 project of Iron Ore Company of Canada has been producing since 1954 but ore shipments to customers in the United States have been mainly by boat.

ONTARIO—Shaft sinking operations for the new Hogarth A-2 underground mine of *Steep Rock Mines Ltd.* are scheduled to start soon. The site has been cleared and an access road is being constructed. This mine will be the largest underground iron ore mine in North America. Its mine plant will be designed for a production rate of 1,000 tons per hour.

Announcing...

TWO NEW THOR SINKERS

developed for use with Sinker Legs

MODEL 37 THOR SINKER

In the 45-lb. class for drilling holes up to 12 feet deep in soft to medium rock. New features include a renewable bronze bushing in cylinder front bearing and a renewable chuck driver nut. Chuck is press-fitted into chuck driver, a construction permitting replacement of parts subject to wear.

MODEL 77 THOR SINKER

In the 55-lb. class, for drilling holes up to 20 feet deep in hardest rock. New yoke type latch retainer locks in position for safety in pulling steels. Renewable bronze bushing in cylinder front bearing. Bronze chuck driver nut assures longer wear. Ask your Thor distributor. Thor Power Tool Co., Aurora, Ill.

THOR POWER TOOL COMPANY

Branches in all principal cities

THAILAND—An agreement has been reached by the Ministry of Industry and the *Rambhai Panan Company* for the establishment of *Thailand Steel Company* which will receive a two-year permit to explore the iron ore deposit at Chiengkarn in Loey province. If the exploration is successful, the company is to erect an up-to-date steel plant within six years of the signing of the agreement. The government will reserve the right to have top priority in the purchase of steel from the plant.

MALAYA—*Taiping Consolidated Ltd.* expects that the property on which its dredge is presently working, under an agreement made with *Kundang Tin Dredging Ltd.*, will be exhausted in 1958. It is planned that the dredge will then be dismantled and moved to the company's own property at Taiping where it will be re-erected. Revised estimates indicate that the cost of this operation will be substantially greater than at first anticipated.

TURKEY—An expansion program is reported to be under way at the *Murgul* copper mines. The French firm of *Mollet* will build a 350-ton-per-day sulphuric acid plant. *WEDAG*, a German firm, will deliver a new mill and flotation equipment; *General Engineering Company*, an English firm, will enlarge the smelter; while *Krypto-Manchester* is responsible for the electrical equipment. The annual production is expected to be increased from about 7,500 tons of blister copper to 12,000 tons.

JAPAN—Two Japanese companies—*Mitsubishi Mining Company* and *Mitsubishi Trading Company*—will join with the Peruvian firm of *Perulex Company* in developing the *Inicia Tiva* iron mine. A new company will be formed by the three firms. It is reported that reserves total 20,000,000 tons, and that company would produce about 1,000,000 tons annually of 65 percent iron ore.

THAILAND—*Lun Sang Tin Mines Ltd.* is completing negotiations for the purchase of a mining property in Takuapa from *Satupulo N.L.* The Lun Sang group of mining companies has become the most important local tin producer—with mines in Takuapa, Bhuket, and Huey Yod. At Ronpibon, the *Hoey Company* has opened a new hydraulic mine.

An Unfailing Market for:

GOLD • SILVER • COPPER
LEAD • ZINC

Ores • Concentrates • Bullion
Precipitates • Furnace Products

FOR SCHEDULES, FREIGHT RATES, ETC., WRITE TO YOUR NEAREST OFFICE

AMERICAN SMELTING AND REFINING CO.

ASARCO

405 Montgomery Street
San Francisco 4, Calif.

700 Crandall Bldg.
8-10 West 1st South St.
Salt Lake City 1, Utah

P. O. Box 1111
El Paso, Texas

P. O. Box 1605
Tacoma 1, Wash.

607 First National Bank Bldg.
Denver 2, Colorado

East Helena, Montana

810 Valley Bank Building
Tucson, Arizona

Over Half Century Experience in

Exploration and Development
Diamond Core Drilling
Rock Breaking—Grouting
Shaft Sinking
Mining—Quarrying
and Tunnel Driving

Full details on request

Bovles Bros. DRILLING COMPANY

1321 South Main St. • Dial HUnter 4-4401
Salt Lake City, Utah

Spokane, Washington
Leadville, Colorado
Phoenix, Arizona
Monticello, Utah
Reno, Nevada

Telephone KEystone 4-0862 and WAlnut 4-2614
Telephone 526
Telephone CHestwood 4-5331
Telephone 9381 and 9184
Telephone FAirview 9-0732

COLUMBIAN ALL-METAL BUILDINGS with Multi-Purpose Uses!

Columbian All-Metal Buildings are ideal for *warehouses, engine houses, dry-houses, shops, garages, pump houses, compressor houses.* Precision fabricated from steel with sectional construction for quick, easy, low-cost erection.

- Exceptionally weathertight
- Minimum upkeep
- Fire-Safe
- Rigid, strong, long-lasting

Order from Distributor

United States
Denver Equipment Co.
1400 17th Street
Denver, Colorado

Elmco Corp.
34 South 4th West Street
Salt Lake City, Utah

Foreign
General Supply Co. S. A.
Vallarta No. 1 Edificio Alberto
Mexico 4, D. F., Mexico

T. M. Reg.

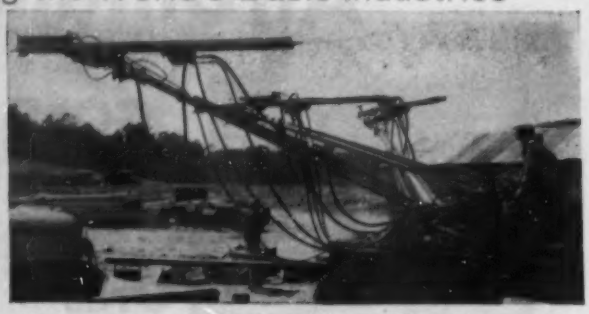
for illustrated descriptive literature, write to:

COLUMBIAN STEEL TANK CO.

P.O. Box 4048-H Kansas City, Mo.

Gardner-Denver . . . Serving the World's Basic Industries

Self-propelled "Air Trac"® drill for rough terrain.



Hydraulic booms and remote-controlled drills for mounting on tractor truck or half-track.

New 5½" heavy-duty rock drill on self-propelled crawler.

All-weather rotaries in 600-foot and 900-foot capacities.

Long-feed tunnel drills and hydraulic booms.

Cost-saving tools for the big push

For open pit production and overburden removal, come to Gardner-Denver for cost-cutting rock drilling equipment. Ask for bulletins.

GARDNER-DENVER

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Export Division: 233 Broadway, New York 7, N.Y., U.S.A.
Gardner-Denver Company, Quincy, Illinois, U.S.A.

There's a Gardner-Denver distributor in your area—
see him for details

MAYALA—The *Eastern Minerals Trading Company*, a Malay-Japanese firm in Kota Bharu, has been offered a loan of $500,000 by Japanese investors. The company's capital of $250,000 has been found to be inadequate for large-scale mining operations which were scheduled to start at the end of this year.

TURKEY—It is reported that the *Karabuk* iron and steel works is to be enlarged by the German firm of *Krupps*. As payment, the firm would receive chrome ore from Turkey.

THAILAND—Details of *Mitsui Mining & Smelting Company's* contract with a leading Chinese trading company in Thailand (see MINING WORLD, September 1956, page 115) have now been revealed. The Chinese firm is *Wip In-tsoi & Company*, an industrial firm with offices in Bangkok. If the Foreign Investment Council authorizes the joint venture, Mitsui will have 49 percent of the stock and Wip will have 51 percent. The new firm will develop the *Khao Kiam* tungsten mine, the *Wang Phra* tungsten mine, *Shin San* tungsten and tin mine, and *Na Mon* tin mine, all owned by Wip In-tsoi & Company. Mitsui is expected to send 10 technicians to Thailand this year. The tungsten ore reserves at the Wang Phra mine are 540,000 tons, and at Khao mine, 80,000 tons.

BURMA—The Government of Burma reportedly has withdrawn its proposal under which the mines of the *Consolidated Tin Mines of Burma Ltd.* would be operated jointly with the government.

PAKISTAN—The government plans to send 10 parties into the field to survey radioactive minerals in Pakistan during this financial year at an expense of 5,000,000 rupees.

INDIA—The government has decided to set up four regional councils with centers in Ajmer, Calcutta, Nagpur, and Bangalore to advise, control, regulate, and execute the program of mineral development. The cities selected cover the following regions: Amjer, the north-west region; Calcutta, the eastern region; Nagpur, the central region; and Bangalore, the southern region. These councils will review periodically the program and progress of exploration and investigations undertaken in their zones; make suggestions for future programs; review and advise on consumer industry mineral requirements; inquire into mining difficulties, such as transportation; and generally advise on the development of minerals and allied natural resources of the region.

GOA—The country's chief mineral exports are iron ore and manganese ore, with export figures progressively rising over the last few years. No investigations of mineral resources have been carried out to date but numerous iron, manganese, and ferruginous manganese deposits are being developed in the iron ore zones, the geological structure of the soil presents rocky strata of ferruginous quartzite and the ore consists mainly of hematite. These mines are generally worked by open cuts utilizing the bench system. The manganese ore regions show typical residual deposits consisting chiefly of pyrolusite and psilomelane in a matrix of decomposed country rock near the surface. Here the general practice is to open quarries or pits after the lateritic overburden is removed from the faces.

ASIA—A Working Party of senior geologists has been preparing a regional geological map for Asia and the Far East, under the sponsorship of the Economic Commission for Asia and the Far East. Two meetings so far have resulted in major decisions concerning plans for financing the preparation of the map; questions of coordination of various national works; target date for completion of country geological maps; map projection; and preparation of index maps showing the status of geological surveys. Also to be undertaken is compilation of a regional mineral distribution map for Asia and the Far East, as well as regional maps showing mineralization epochs and provinces as a guide for mineral prospecting. Participants come from 13 countries and territories.

PERU—*Cerro de Pasco Corporation* is spending $200,000 to re-equip an old open pit located between the Lourdes shaft and the Paragsha concentrator near Cerro de Pasco village. The company plans to mine 1.0 to 1.2 percent copper ore, which is now mainly chalcopyrite, but later is expected to enter zones of enargite. The ore will be crushed at the site and trucked to the Paragsha concentrator. The copper section of this plant has been expanded from 1,200 to 1,400 tons ore daily capacity.

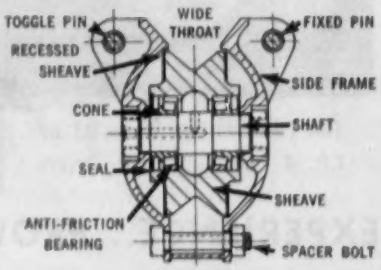
JAMAICA—*Jamaica Mining* is the name of a new company formed by *Mogul Mining Corporation* and *New Consolidated Canadian Exploration* (Newconex). The latter is itself a newly formed, wholly owned subsidiary of *New Consolidated Gold Fields Ltd.* Jamaica Mining will have exclusive mining rights over 500 square miles in the colony, and these concessions are thought to cover all the known important copper and iron ore occurrences there.

MEXICO—A 100-ton flotation mill has gone into operation at the *Marina* mine located at Huizuco, state of Guerrero. It will produce antimony contained in mercury ore. The ore is a Livinstonite in which the grade of mercury is always in a certain relation to the antimony. The ore is passed to the flotation mill after it has been calcined to extract the mercury. It is reported that there is little oxidation on the ore during the calcination process since the operation is carried out in a closed retort furnace. Owner of the mine is Jose Jimenez Jaidar who started the operation about four years ago. At that time he was only extracting the mercury; the calcines containing the antimony were sent to the dump.

HONDURAS—*New York & Honduras Rosario Mining Company* attributed a six-month decline in profits to "a decrease in non-recurring income and an increase in costs." The principal cost increases were reported to be additional expense of Diesel electric power and costs connected with a new development and drainage tunnel. New roasting process equipment to handle refractory ore has been placed in operation recently. Current production is from the *El Mochito* mine.

TAIL ROPE
CARRYING BLOCKS
6" and 8"
Wide-Throat • Heavy Duty

Take one apart and you'll see why they *stay* underground and give you years of dependable, trouble-free service. Model 6 WT with shackle weighs 34 lbs. Model 8 WT with shackle weighs 81 lbs. For more detailed information on these and other Pacific Sheave Blocks, send for Bulletin No. 271.



Solid side frames. Extra-heavy construction of both groove and flanges. Made of heat-treated alloy steel for maximum toughness. Sheave is recessed into side frames to prevent rope fouling. Roller bearings are grease-sealed to prevent entrance of foreign matter.

A

ALLOY STEEL & METALS CO.

1848 East 55th Street • Los Angeles 58, Calif.
Mail Address: Box 58323 Vernon Sta., Los Angeles 58

HAITI—*Reynolds Metals Company* has formed a new subsidiary, *Reynolds Haitian Mines Inc.*, to direct the new bauxite mining operations in Haiti. Walter L. Rice has been elected president of the new firm. Final completion of the Haitian facilities is not expected until 1957, but operations have started and a substantial stockpile will be on hand when loading of the ships is started. The facilities are designed for a regular production of 400,000 tons annually, with reserve capacity sufficient to process 900,000 tons per year and to ship larger quantities when necessary.

MEXICO—Wadie Sroor Maloof is operating a manganese jigging plant in the city of Chihuahua. He is treating ore from some property near Chihuahua which reportedly runs 28 percent to 30 percent manganese. By several tests he has been able to produce a concentrate containing 42 percent Mn. The ore is highly silicious. The plant will also be run as a custom mill.

PERU—*Cia. Minera Atacocha S.A.* has increased the capacity of its Chaprin hydroelectric plant by the addition of a third generating unit. This plant is located on the Huallaga River, about 14 miles from the company's concentrating plant. Cia. Minera Atacocha is developing a lead-zinc ore body with a high content of silver and gold. The property is about 20 kilometers from the *Cerro de Pasco* operations, and is at an elevation of 4,000 meters. Current plant output is about 1,000 tons of ore every 24 hours.

BOLIVIA—*Compania Candelaria* is now developing a manganese deposit (pirolusite) with a content of 48 percent Mn (metallurgical grade). The deposit is located 30 kilometers from Sucre, and is estimated to contain 20,000,000 tons in reserve. The firm plans to install electric furnaces to produce ferromanganese for export to the United States and Argentina.

JAMAICA—*Kaiser Bauxite Company*, a wholly owned subsidiary of *Kaiser Aluminum & Chemical Corporation*, shipped 1,838,000 tons of bauxite from Jamaica in 1955. This was an increase of 258,000 tons over the previous year. New facilities now under construction will expand bauxite production to about 4,100,000 tons. The program provides for additional mining, railroad, and dock facilities.

BRAZIL—A group of Japanese capitalists have decided to collaborate with the Brazilian government in the erection of a steel plant. The Japanese will supply funds, as well as machinery and highly trained technicians. The new steel plant will be located in the state of Minas Gerais close to the well known hematite deposits located there. It will be called *Usina Siderurgica de Minas Gerais (Usiminas)*.

MEXICO—A number of mining companies operating in the Panuco, Papaloa-

SKINNER DRYERS
AT LARGE COPPER COMPANY

- each drying approximately 20 tons/hr. of copper sulphide concentrates . . .
- reducing moisture content from approximately 15% to 9%.

Two Colorado Iron Works 23' 6" I.D. 4 hearth Skinner Dryers

EXPERIENCE...*PROVED PERFORMANCE*

Skinner . . . proved for 37 years for efficient roasting and drying of ores, clays, limestone, lime sludge . . . including sulphide roasting; oxidizing, reducing and chloridizing roasts.

COLORADO IRON WORKS CO.

1624 17th Street • Denver 2, Colorado

AKINS CLASSIFIERS • SKINNER ROASTERS • LOWDEN DRYERS

Sales Agents and Licensed Manufacturers in Foreign Countries

A SUBSIDIARY OF THE MINE & SMELTER SUPPLY CO.

WORLDWIDE PROFESSIONAL DIRECTORY

AGENCE MINIERE & MARITIME S. A.
2 rue Van Bree, Antwerp, Belgium
Sworn weighers, samplers, assayers of ores, metals. Agents for shippers to European ports, plants. Market surveyors, commercial advisers assuring sales direct to consumers.

E. J. LONGYEAR COMPANY
Geological and Mining Consultants
MINERAL EXPLORATION AND APPRAISALS
PHOTOGEOLOGY
1700 Foshay Tower • Minneapolis 2, Minn.
420 Lexington Ave. New York 17, N. Y.
416 Colorado Bldg. Denver 2, Colo.
939 Shoreham Bldg. Washington 5, D. C.

JOHN F. MEISSNER ENGINEERS, INC.
Consulting Engineers
Conveyor Systems Storage Methods
Crushing Plants Ship Loading Docks
Materials Handling and Processing Plants
308 W. Washington St. Chicago 6, Ill.

O'DONNELL & SCHMIDT
Mining Consultants
165 Broadway Tel. BArclay 7-6960
New York 6, N.Y. Cables: EXAMIMINES

SCHROTER-LOCKWOOD & ASSOCIATES
Consulting Engineers and Mining Geologists
Industrial and Strategic Minerals
Costs—Methods—Evaluation—Ore Findings
3515 Sunset Blvd. Los Angeles 26, U. S. A.
Cable Address: Stratex-Los Angeles

MARK G. SMERCHANSKI
CONSULTING MINING GEOLOGIST
411 Childs Building
Winnipeg, Manitoba Phone 92-6323

this book contains 42 pages of information and illustrations valuable to every soda ash user.

send for your copy today!

If you use or may use soda ash in your processes, you'll find a wealth of valuable information in this new book. We believe it is the most enlightening catalog-data book yet to be published on soda ash. The first 20 pages will give you a new concept of soda ash and how good it *can* be. Succeeding pages contain specifications, handling data, many useful charts and helpful tabular technical data.

Published in a limited edition, this is not a book for the tyro or the idly curious. It is a valuable text for every metallurgist and mill or smelter superintendent. A letterhead request or the handy coupon at the right will bring your copy.

I am interested in knowing more about WESTVACO Soda Ash. Please send a copy of your new Soda Ash book to

NAME_____

POSITION_____

COMPANY_____

ADDRESS_____

Westvaco CHEMICALS

fmc FOOD MACHINERY AND CHEMICAL CORPORATION

Westvaco Chlor-Alkali Division
FOOD MACHINERY AND CHEMICAL CORPORATION
161 E. 42nd St., New York 17 · Chicago St. Louis Denver Philadelphia So. Charleston, W. Va.

FMC CHEMICALS INCLUDE: BECCO *Peroxygen Chemicals* • WESTVACO *Alkalies, Chlorinated Chemicals and Carbon Bisulfide* • NIAGARA *Insecticides, Fungicides and Industrial Sulphur* • OHIO-APEX *Plasticizers and Chemicals* • FAIRFIELD *Pesticide Compounds and Organic Chemicals* • WESTVACO *Phosphates, Barium and Magnesium Chemicals*

pan, Cazones, and Coatzacoalcos basins, and which now export through Tampico, Tuxpan, Veracruz, Alvarado, and Coatzacoalcos, are now planning to build their own docks and warehouses. The object is to speed movement of their products, especially fluorite and sulphur, and to cut costs of long stays in these ports by ocean-going freighters. One of these firms is reported to be *Solis Testing Service* which has asked the Marine Ministry for permission to build docks at Tampico. Meanwhile, the Ministry reportedly will extend the length of its "metals dock" in the same port from the original 150 meters to 300 meters. About 100 meters have already been completed.

PERU—The installation of the Tonsuyoc concentration plant of *Banco Minero* in the Huarochiri district in 1955 encouraged the *Sindicato Minero Pacococha* to open its small mine near the mill. The success of the mine, however, has been so great that expansion in production is now underway. At present four levels have been opened, with only 200 feet between the extreme ones. The upper levels showed poor mineralization caused by oxidation, but on the so-called 100 level the vein is well formed. It is between five and nine feet wide, averaging 6.0 percent copper and lead. Shrinkage stoping methods are used, with production running about 1,500 tons of ore monthly. This is treated at the Mahr Tunnel mill of *Cerro de Pasco Corporation* in Yauli. Two new levels will be developed at 150 and 500 feet below the 100 level by means of adits already started. To reach the vein, the first adit will be 900 feet long and the lowest about 1,300 feet long. The present crew of 50 men will be increased when these levels are finished and ready for increased production.

CUBA—The *Nickel Processing Corporation*, a subsidiary of *National Lead Company*, has completed another record breaking year in the operation of the United States government's *Nicaro* nickel plant. The plant produced 31,460,000 pounds of nickel in the 12 months ended June 30th. Production last year had been 29,504,000 pounds. The record was made during this past year despite an extensive program which has been underway in the plant. When completed, the plant's capacity will be increased to 49,000,000 pounds. The Nickel Processing Corporation's Mayari mines—the *Bella Maria, Casualidad, Gloria, San Juan,* and *El Nengo*—produced 392,225 tons of nickel ore during the period from April to June of this year. Exported during that period were 909,465 pounds of nickel oxide in powder form and 8,698,465 pounds in granulated form.

MEXICO—A large steel plant for treatment of ores from the mines in Colima and the nearby states of Jalisco and Michoacan will be built in the Pacific port of Manzanillo by a group of German and Mexican investors, according to Federal Senator Roberto A. Solorzano of the state of Colima. Half of the capital will be put up by the Germans, who will also provide technicians and equipment. The remainder of the capital will be supplied by the *Nacional Financiera*, Mexican government agency. An important phase of the project is construction of a railway linking Manzanillo with Minatitlan, Colima, for transportation of minerals.

RIBLET
AERIAL TRAMWAYS

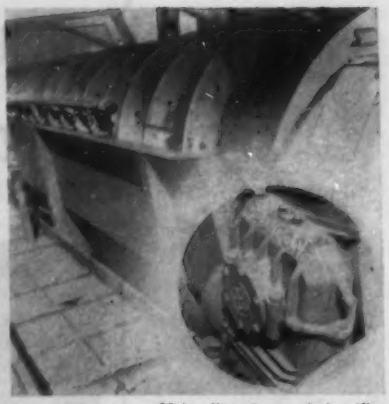
Any Type
All Capacities

Have you seen the late models?

Heavy-capacity newly designed Riblet Aerial Tramways can operate for low-cost per ton hauled.

Riblet Aerial Tramways can handle any product over all terrain. Latest labor-savers are used for bucket handling in new Terminals.

RIBLET TRAMWAY CO.
Box 7, Sta. A, Spokane, Washington
59 Years of Experience



60 in. diameter sand classifier

RADICON
Speed Reducer

Spirals Water Out of 1200 Tons of Sand

To many a plant completely dependent on its classifier for a full 8-hour day, the all-important speed reducer must be efficient, rugged and reliable.

For example, this triple pitch, 60 in. classifier de-waters sand and filters rock to the tune of 150 tons per hour—continuously for the entire day. The Radicon specified to do the job is model 8 RHU (ratio 40:1). Using a 10 hp motor at 1,900 rpm, the Radicon output shaft delivers 47 rpm into the final reduction—at 85% efficiency.

The above installation is completely in the open—an example of the fan-cooled Radicon's ability to withstand extremes of temperature as well as dust and rain. Immediate delivery of the 8 RHU Radicon. Packaged Drives supplied by authorized David Brown factory branches and distributors.

Portland, Oregon: Zidell Machinery & Supply Co.
San Francisco-Oakland: George M. Philpott Co., Inc.
Seattle, Washington: Cascade Machinery Co.

DAVID BROWN
INC.
999 Beecher Street, San Leandro, California
6825 Atlantic Boulevard, Maywood, California

Gear Products for: paper and pulp mills, chemical plants, mines, food processors . . . conveyors, hoists, agitators, screens, deckers, filters, canning machines, and other industrial equipment.

SuperDuty
DIAGONAL DECK
No. 6
CONCENTRATOR TABLE

High Capacity SuperDuty® Tables Enhance Mineral Concentration and Profits

The SuperDuty® DIAGONAL-DECK® Concentrating Table delivers highest grade concentrates while minimizing losses to the tailings and, at the same time, reducing the volume of middlings for recirculation.

This lighter middling load not only makes room for more tons of new feed per day, but eases wear and tear on the circulating equipment. Send for Bulletin 118-B.

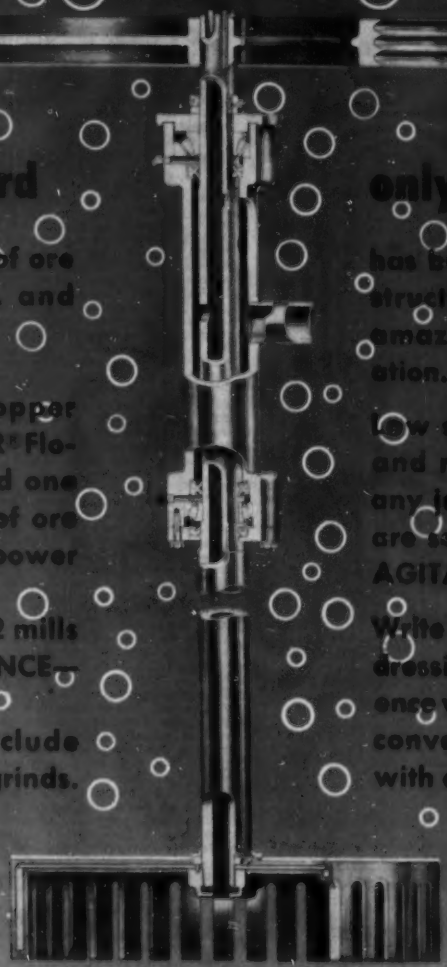
The Deister Concentrator Co., Inc.
The Original Deister Co., Incorporated 1906
925 Glasgow Ave. Ft. Wayne, Ind., U. S. A.

CHALLENGING COST FIGURES COME TO THE SURFACE

via AGITAIR® FLOTATION

This is the record

Average cost per ton of ore treated in many U.S. and foreign installations:
POWER—1.50 KWH
(A large porphyry copper installation of AGITAIR® Flotation Machines saved one operation 1c per ton of ore treated owing to low power consumption.)
MAINTENANCE—1 to 2 mills
LABOR for MAINTENANCE—1/10 mill
The above figures include both coarse and fine grinds.



Cut-away, the AGITAIR® bearing assembly, shows detail of bearings, seals, air induction, rubber covered impellers, etc.

only AGITAIR®

has built-in features of construction for achieving this amazing economy of operation.

Low speed, simple design, and ready adaptability to any job of ore beneficiation are several of the exclusive AGITAIR® features.

Write or phone your mineral dressing problems. A conference will be arranged at your convenience for discussion with a Galigher Engineer.

Leaders in Experience and Service

HOME OFFICE: 545-585 W. 8th South
P. O. Box 209
Salt Lake City 10, Utah
EASTERN OFFICE: 921 Bergen Ave.
(Room 721)
Jersey City 6, New Jersey

THE GALIGHER CO.

METALLURGICAL DIVISION · ENGINEERING SERVICE

CONSULTATION • ORE TESTING • PLANT DESIGN

A-513

GALIGHER PRODUCTS: AGITAIR® Flotation Machines, VACSEAL Pump, Geary-Jennings Sampler, Acid-proof Sump Pump, Geary Reagent Feeder, GAL-CLONES, Laboratory AGITAIR® Flotation Machine, Laboratory Pressure Filter, Laboratory Ball Mill, Rubber Lined and Covered Products, Plastic Fabrication.

This Screen Guard can be used in any mining and industrial field and is particularly adaptable for use in flumes. Only the finer particles pass over the screen.

mining

foods

WEDGE WIRE

PREPARATION SCREENS AND SCREEN GUARDS PERFORM WITH

top efficiency

chemicals

abrasives

oil

The trade name KLEENSLOT stands for high quality precision made screens, giving top performance and efficiency in screening, dewatering, washing, extracting, filtering, or sizing applications. They are made of specially formed wedge shaped wire to afford clear rapid passage of materials and to eliminate blinding. Highest production is the greatest feature of WEDGE WIRE products. Write for literature!

WEDGE WIRE Vibrator Screens can be designed to fit any make of vibrator.

Wedge-Wire CORPORATION
Gas Street at Nickle Plate R. R.
Wellington, Ohio

U.S.A. Metal & Mineral Prices

METALS

		September 17, 1956
COPPER:	**Electrolytic.** Delivered F.o.b. cars, Valley basis	40.00¢
	Lake. Delivered, destinations, U.S.A.	40.00¢
	Foreign Copper, Valley basis	40.00¢
LEAD:	**Common Grade.** New York	16.00¢
ZINC:	**Tri-State Concentrates,** jig, flotation 80% lead, per ton	$201.32
	Prime Western: F.o.b. E. St. Louis	13.50¢
	Prime Western; Delivered, New York	14.00¢
	Tri-State Concentrate, 60% zinc, per ton	$84.00
ALUMINUM:	**Primary 30 Pound Ingots (99% plus).** F.o.b. shipping points	27.10¢
ANTIMONY:	**Lone Star Brand.** F.o.b. Laredo, in bulk	33.50¢
BISMUTH:	(In ton lots) price per pound	$2.25
CADMIUM	**Sticks and bars,** 1 to 5 ton lots (Price per pound)	$1.70
COBALT:	**97-99%, keg of 550 pounds (Price per pound)**	$2.60
COLUMBIUM:	**Powder**	Nom., per pound $119.25
LITHIUM:	98%, (per pound)	$11.00-$14.00
MAGNESIUM:	**Ingots (99.8%)** F.o.b. Velasco, Texas, per pound	36.00¢
MERCURY:	**Flasks,** Small lots, New York	$255.00-$257.00
NICKEL:	**"9" Ingots (5 pounds). F.o.b. refinery, Port Colbourne, Ontario**	64.50¢
SELENIUM:	**99.5%,** per pound	$13.50-$15.50
THORIUM:	**per kilogram:**	$43.00
TIN:	**Grade A Brands.** New York (Price per pound) Prompt delivery	108.0¢
TITANIUM:	**99.3% + Grade "A" Sponge** (Price per pound)	$3.00
URANIUM	**Nominal, per kilogram**	$40.00
U-235:	**Nominal,** per kilogram	$11,000.00
GOLD:	**United States Treasury Price**	**$35.00 per ounce**
SILVER:	**Newly mined domestic.** United States Treasury price	90.5¢
	Foreign Handy Harmon	90.75¢
PLATINUM:	**Per Ounce**	$103.00-$105.00
ZIRCONIUM:	**Sponge, Per Pound,** Nominal	$10.00

ORES AND CONCENTRATES

BERYLLIUM ORE: **10 to 12% BeO.** F.o.b. mine, Colorado — $45.00 per unit
Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at $400.00 per short ton or by assaying at: 8.0 to 8.9% BeO, $40 per unit; 9.0 to 9.9%, $45; over 10.0%, $50.

CHROME ORE: **F.o.b. railroad cars eastern seaports. Long tons dry weight.**
African (Rhodesian). 48% Cr_2O_3. 3 to 1 Ratio — $55.00-$56.00
African (Transvaal). 48% Cr_2O_3. No Ratio — $38.00-$39.00
Turkish, 48% Cr_2O_3. 3 to 1 chrome-iron ratio — $58.00
U. S. Government ore purchase depot Grants Pass, Oregon, Base price, lumpy ore, $115.00; fines and concentrates $110.00 for 48% Cr_2O_3 and a 3 to 1 chromium-iron ratio, Premiums for higher grade ore and for a ratio up to 3.5 to 1. Penalties for grades down to 42% Cr_2O_3.

COLUMBIUM-TANTALUM ORE: At United States small lot beryl purchase depots, $3.40 per pound contained combined pentoxides in 50% ore. Includes 100% bonus. (Government stopped buying temporarily May 12)

IRON ORE:
Per Pound Pentoxide. — $1.15-$1.30
Lake Superior, Per gross ton Lower Lake Ports
Mesabi, Non Bessemer, 51.5% Fe. — $10.85
Mesabi, Bessemer, 51.5% Fe. — $11.00
Old Range Non Bessemer. — $11.10
Old Range Bessemer. — $11.25
Swedish, Atlantic Ports, 60 to 68% Fe. Contracts, Per Unit — 22.00¢

MANGANESE ORE:
Metallurgical grade. 48 to 50% Mn. Long ton unit — $1.40
Metallurgical grade. 46 to 48% Mn. Long ton unit — $1.33
Metallurgical grade. 44 to 46% Mn. Long ton unit — $1.29
Chemical grade. 80% MnO_2. Per Ton — **$70.00**
Domestic U. S. Government ore purchasing depots: Butte, Montana; (black and pink ores) base price of $4.87 per long dry ton of 18% manganese ore. Phillipsburg, Montana; base price of $6.43 per long ton unit of 15% manganese ore. Small lot program f.o.b. railroad cars, minimum 40% Mn. Base price (48%) $2.30 per unit with premiums and penalties.

MOLYBDENUM CONCENTRATE: **90% MoS_2 F.o.b. Climax, Colorado. Per pound of contained molybdenum,** plus cost of containers — $1.10

TUNGSTEN CONCENTRATE:
Domestic. 60% WO_3 Per short ton unit — $55.00
Foreign. 65% WO_3 Per short ton unit (Scheelite) — $32.00

URANIUM ORE:
Foreign. South American, Spanish, Portuguese — $33.00
Carnotite-Roscoelite. F.o.b. purchase depot plus $0.06 per ton mile ($6.00 maximum), **Grand Junction, Rifle, Durango, Naturite and Uravan, Colorado. Salt Lake City, Marysvale, Thompsons, Moab, White Canyon. Green River, and Monticello, Utah. Shiprock, and Grants, New Mexico, Edgemont, S. Dakota, Riverton, Wyoming, Tuba City, and Cutter, Arizona.** Base price for 0.10% ore is $1.50 per pound and up to $3.50 per pound of contained U_3O_8 plus $0.75 per pound for each pound in excess of 4 pounds per short dry ton and an extra allowance of $0.25 per pound for each in excess of 10 pounds. A $0.50 per pound development allowance paid on all ore purchases. Special lime schedule applies at Monticello, Moab and Grants. No lime penalty with no vanadium payment or lime penalty with vanadium payment.

VANADIUM ORE: **Carnotite-Roscoelite. V_2O_5 in ratio of more than 10 parts to 1 part of U_3O_8 are generally acceptable at all AEC depots,** but excess not paid for at **Marysvale, Monticello, and Bluewater. Shiprock has no limit on V_2O_5 to U_3O_8 ratio** and all contained V_2O_5 is paid for — Per Pound V_2O_5 $0.31

NON-METALLIC MINERALS

BENTONITE: **Minus-200-mesh.** F.o.b. Wyoming points. Per ton in carload lots — $12.50

FLUORSPAR:
Oil Well grade. Packed in 100 pound paper bags — $14.00
Metallurgical grade. 70% effective CaF_2 content per short ton F.o.b. Illinois-Kentucky mines — $32.00-$35.00
Mexican, 70% f.o.b. border — $24.00-$24.50
Acid Grade. 97% CaF_2 F.o.b. Kentucky, Illinois, Colorado — $47.50-$50.00
Government buying f.o.b. producer's shipping point: 60% Illinois-Kentucky, $34.50 per ton, others $28.50; 70% Ill.-Ken. $38.50, others $32.50.

PERLITE: **Crude: F.o.b. mine per short ton** — $3.00 to $5.00

SULPHUR:
Plaster grades. Crushed and sized, F.o.b. plants — $7.00 to $9.00
Long ton, F.o.b. Hoskins Mound, Texas — $25.50
Export — $30.50

LONDON METAL AND MINERAL PRICES

		September 17, 1956 Per Long Ton		USA Equivalent cents per pound*
COPPER:	**Electrolytic spot**	£307	0s 0d	38.37¢
LEAD:	**Refined 99%**	£117	10s 0d	14.69¢
ZINC:	**Virgin, 98%**	£95	15s 0d	11.59¢
ALUMINUM:	**Ingot, 99.5%**	£197	0s 0d	24.625¢
ANTIMONY:	**Regulus, 99.6%**	£222	10s 0d	27.81¢
TIN:	**Standard, 99.75%**	£816	0s 0d	102.50¢
TUNGSTEN:	**Long ton unit, 247 $**	$34.58		

With Sterling pound at $2.80.

*Quotations on metals and certain ores through the courtesy of *American Metal Market*, New York, N. Y.

Bluewater Mill

Continued from page 51 (WM43)

Separan solution is added to Burt filter feed, to the pulp feed to No. 1 Oliver, to the repulper of No. 1, and a small amount to the repulper of No. 2 filter.

With the two types of filters almost any ore can now be treated. Difficult filtering ores can be forced through the Burts, also the Burts will filter pulp too coarse to be picked up on the Olivers.

Precipitation of uranium from carbonate solution and recarbonation of leach solution have not changed. The boiler which supplies process steam, and flue gas for recarbonation, now burns natural gas instead of coal, however.

The Metallurgical Staff

Mill expansion has meant added responsibilities for the staff. Here are key personnel: F. S. Cook, assistant to the manager; T. M. Fitch, mechanical superintendent; William J. Roberts, superintendent of both mills; W. R. Stearn and A. K. Veeder, assistant superintendents; and J. Harvey Glover, general mill formean; all in the acid plant. T. R. Beck is assistant mill superintendent in direct charge of the carbonate mill, and J. P. Bee is general mill foreman.

Amos Leach is general foreman of crushing and sampling plants; Jack Pate, chief chemist; F. G. Holmberg, chief clerk; Wayne Hickson, power plant and acid manufacturing plant superintendent; R. L. Millard, storekeeper; M. D. Barnaby, chief electrician, and William Marshall, safety engineer.

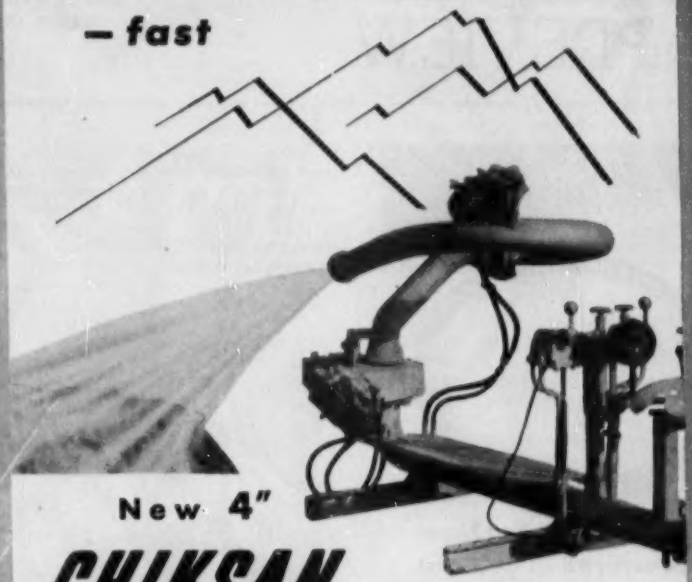
This is the story of Anaconda's Bluewater mill today; of the metallurgists, engineers, chemists, and scores of other skilled employees; and of the equipment conventional and special. Money, too, has been most important; to the start of acid plant operations, Anaconda's capital investment in plant was approximately $23,000,000.

The final and most important result has been an ever increasing flow of uranium concentrate to the Atomic Energy Commission's Raw Materials Division. And this concentrate was available when most needed—before the big production boost of new mills which will begin operation in the last half of this year.

After 1962 what? Nobody knows at this early date. But, everybody knows that Anaconda with its own mines and four flexible milling units will be a most important factor.

HOW TO MAKE A MOLEHILL OUT OF A MOUNTAIN

— fast



New 4"

CHIKSAN

intelli-Giant

Capable of throwing a powerful 300 foot stream at the rate of 2000 gpm, the new 4-inch Intelli-Giant literally blasts away burden in record time. Hydraulic controls, operated manually or by remote, reduce operator fatigue, permit pinpoint control of stream. Horizontal travel of 270° and verticle sweep of 120° assures maximum coverage from single location. 650 pound weight permits trailer mounting for transporting and movement at the job.

IF YOUR OPERATIONS INCLUDE:
Hydraulic Mining
Dam Construction
Slurrying
Stripping
Earth-Rock Compaction
High Pressure Jet Operations
You can profitably use an Intelli-Giant

For descriptive literature, write Dept. 20-10

CHIKSAN intelli-Giant

CHIKSAN COMPANY • *A Subsidiary of Food Machinery and Chemical Corporation*
Brea, California • Chicago 5, Illinois • Newark 2, New Jersey
Well Equipment Mfg. Corp. (Division) Houston 1, Texas • Chiksan Export Company, Brea, Calif.; Newark 2, New Jersey, Chiksan of Canada Ltd., Edmonton, Alta.

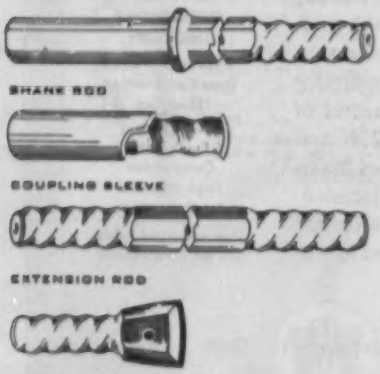
PRODUCTION EQUIPMENT PREVIEW

PEP is just what new equipment, increased mechanization, and new methods can give to your mine, mill or smelter. This PEP section is MINING WORLD's way of making available to you some of the finest current information on mechanization.

New Steel Mine Set Now Manufactured in Arizona

A new type steel mine set is now available from the Chapman Dyer Steel Manufacturing Company of Tucson, Arizona. As you can see from the photograph, the cold shaped steel sets are relatively simple to set up, and give far better service than comparable timber sets. Already in use by several copper companies, the sets are proving themselves.

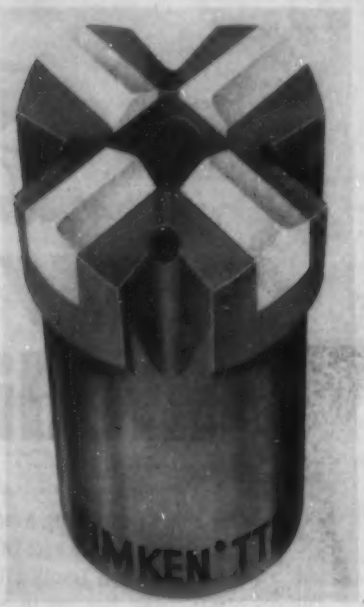
Sets now being manufactured are constructed from four-inch H-beams, and have a diameter of six feet six inches. With quantity purchases, price is approximately $35 per set. For further information circle No. 73.



Low-Cost Exploration With Copco Extension Steel

Developments in Sandvik Coromant extension steels which make possible exploration holes 75-to-100 feet deep at costs as low as 25 cents to 50 cents per foot, have been announced by the U.S. Atlas Copco companies.

The ⅝-inch rope-threaded steels have been designed for both long-hole mine drilling and shallower-depth construction industry quarry blasting. The exclusive rope-thread insures easy connections and most important, normally, the rods can be uncoupled by hand—a definite saving in time and labor. The steels are collared to fit the ⅝-inch by 4¼-inch chucks of all standard rock drills. Circle No. 72 for additional information.



Tapered Socket Carbide Insert Bits by Timken

The Timken Roller Bearing Company has announced a new line of rock bits to be manufactured at Colorado Springs, Colorado. The new bits are of the tapered socket carbide insert type and come in answer to the increasing use of light air-leg drills both in this country and in Canada.

Experience with these light weight drills show that their fullest economy is realized with bits such as these now introduced by the Timken Company. According to the manufacturer the new tapered socket carbide insert rock bits offer several distinct advantages: 1) They can be removed from the drill steel and discarded without throwing away the drill steel; 2) four-point cross bits give longer life and greater footages between sharpenings; and 3) the tapered pin is easily fabricated on the drill steel. For further information circle No. 69.

North African Survey Flight Data Available

The results of an 805-mile airborne magnetometer flight over North Africa and Portugal were published recently in a paper "Tunis to Lisbon Airborne Magnetometer Profile" by Dr. William B. Agocs, Chief Geophysicist, Aero Service Corporation, Philadelphia.

The general geology of the area over which the profile was flown is shown, along with the magnetic variations. Depth, structural and rock type interpretations have been made from the magnetic control. The data shown in this profile should be of general aid in correlating known structure with their basement indications, and the reported depth determinations should yield some measure of the sedimentary thickness in the basins.

Copies of the paper may be obtained, on request, from Robert Sohngen, Aero Service Corporation, 210 East Courtland Street, Philadelphia, Pennsylvania.

70-Ton Dump Trailer Now in Service

Built by the Marion Metal Products Company, a new 70-ton capacity Hopper Dump trailer has recently been put into service. A 400-hp Kenworth tractor provides prime power for this unit.

Designed to carry 95 cu. yds. struck and 100 plus cu. yds. heaped the new unit will operate at speeds up to 34 mph.

The manufacturers state that the new unit maintains all the advantages of a two-axle, single-axle drive truck, including shorter turning radius and less chassis weight. The advantage, it is said, will allow larger capacities and greater production. For further information circle No. 68.

Scott's Concentrators Have New Magnetic Separator

A new "Magnetic Filter" and three concentrating devices for recovering gold are now available from Scott's Concentrators in Fair Oaks, California. Scott's "Magnetic Filter" utilizes a falling column of water, air or oil to carry metal bearing material into a magnetic field for separation of mineral particles. Sizes of this patented concentrator vary from 3 inches to 6 feet in width and 6 inches to 6 feet in height.

For gold recovery the firm offers the Incline Amalgamator consisting of a series of inclined amalgamation plates having a gyrating motion insuring complete wetting gold surfaces; a portable placer machine and the Goody process for the recovery of extremely fine "flour" gold ordinarily lost in sluicing. Circle No. 80.

HOSE FITTINGS: A new condensed industrial catalog listing Hose, Fittings, Socketless Kits, and Self-Sealing Couplings, has been released by Aeroquip Corporation, Jackson, Michigan. Prepared for use in ordering Aeroquip parts, it contains information on the company's standard industrial products and is designed primarily for use in the replacement field. Circle No. 1 for your copy.

EXTEND BATTERY LIFE: Improvements in stationary batteries which are expected to extend service life up to ten per cent and reduce maintenance requirements are described in a new catalog published by Exide Industrial Division of The Electric Storage Battery Company. Send for your free copy, Circle No. 2.

NEW END-SHIELD Bearing Synchronous Motor is the subject of a new bulletin recently released by the Allis-Chalmers Manufacturing Company. The motors meet the growing demand for a high degree of protection, combined with maximum accessibility for a variety of direct-connected or geared applications. Circle No. 3 for your copy.

DAVIS PIT BULL is the name of a new Massey-Harris-Ferguson Inc. tractor now available for you. This rubber-tired, competitively-priced shovel-loader is built to handle a variety of auxiliary attachments. It includes many new features. Find out more on this new loader, circle No. 4.

SAF-EARS is a new development designed by the Hartford Ear and Acoustic Laboratories. The ear plugs are primarily designed to drastically reduce noise to a safe level for personnel. Tests in noisy locations have produced attenuations up to 45 d.b. In other words, you can now work with extremely loud machines in relative comfort. Circle No. 5 for further information.

COPPER FLOTATION: The Denver Equipment Company has published a flowsheet study on the flotation of copper for the treatment of copper as chalcopyrite with gold and silver values. The flowsheet shows the crushing, grinding, flotation, and thickening and filtering sections. Circle No. 6 for your copy.

RECIPROCATING PUMPS: Dean Brothers Pumps Inc. have recently published an engineering type bulletin on their line of horizontal, forged steel cylinder, steam driven, and reciprocating pumps. These pumps are available for a wide range of heavy duty, high pressure services. Circle No. 7 for your copy.

VIBRATING BAR GRIZZLY: For the full story on Nordberg's Symons Vibrating Bar Grizzly, read their new bulletin describing this unit. The bar grizzly is a heavy duty scalping unit with a capacity up to 1,000 tons per hour. Circle No. 8 for your copy of bulletin 621.

TORQUE CONVERTER: Series 13,800 Twin Disc Three-Stage Torque converter, is the title of Bulletin No. 507 recently released by Twin Disc Clutch Company. This new series Converter expands the Twin Disc line to include every horsepower range from 40 to 1,000. Send for your bulletin, circle No. 9.

BELT CONVEYOR IDLERS, hand and motorized winches, bin level controls, speed reducers, and many more items are fully described in a new brochure recently released by the Stephens-Adamson Manufacturing Company. Circle No. 10 for your copy of this interesting bulletin.

NEW LEADED STEEL: ALCO Products, Inc. has announced the development of a new leaded steel that has resulted in very impressive decreases in machining tool costs. The improved material, called Hi-Qua-Led Steel, is produced in all steel grades in forged and rolled rings from 18 inches to 145 inches over-all diameter, and in ingots to 50,000 pounds. Circle No. 11.

ENGINEERING INSTRUMENTS: The Los Angeles Scientific Instrument Company (Lasico) has available for you a complete line of optical transits, theodilites, transits and levels, incorporating the latest advancements in these instruments. Other precision instruments are also available. Circle No. 12 for free descriptive literature.

LABORATORY CRUSHERS: The Bico Corporation of Burbank, California has available a complete line of lab size crushers and pulvers. They also feature the new Bico ceramic grinding plates enabling you to grind your samples with zero contamination. If you are interested in gemstones, Bico has a small crusher called the "Chipmunk" which will reduce your stones ready for tumbling at the rate of 800 pounds per hour. Circle No. 13 for additional data.

SURPLUS EQUIPMENT: The Fisher Contracting Company of Phoenix, Arizona is presently selling their surplus equipment at greatly reduced prices. Some of the excavating equipment they have for sale are hard-to-get five-yard and smaller electric shovels, dragline buckets, trucks, graders, etc. If you are interested circle No. 14.

ENGINEERING DATA CHART for your office can be obtained from the Parkin Engineering Corporation. The useful chart features tables on decimal equivalents, temperature conversions, wire size and current ratings, and electrical conversion tables. Circle No. 15 for your copy.

CIRCUIT FAULTFINDER: Parr Manufacturing Corporation, have recently announced the production of the new Model 58 Brunt Faultfinder. This instrument is a combination ground detector and fault finder for use on normally ungrounded power circuits while these circuits are energized. Circle No. 19 for further information on this useful device.

NEW "V-LINE": A new "V-Line" of International heavy-duty trucks, featuring three new V-8 engines, is now available. This new line includes nine series of trucks in conventional and cab-over-engines, four and six-wheel design. Models are available with gross vehicle weight ratings of 24,000 pounds and up, and gross combination weights of 50,000 pounds and up. Circle No. 20

NEW CLAMSHELL BUCKET: To speed shaft mucking and excavating, Blaw-Knox Company has introduced a new type clamshell bucket which is now generally available through the company's distributors. The clamshell is a pneumatic closing type for use with single drum hoists. Circle No. 22 for further information.

LITTLE CHIEF is the name of the new high pressure portable type rock duster for dry or wet rock dusting, developed by the American Mine Door Co. It delivers from 35 to 60 feet of dust per minute through 50 to 400 feet of 1¼-inch hose. Equipped with a wet nozzle and water supply at 20 to 25 pounds pressure, dusting may be kept within the 40 feet of the face area prescribed by the Bureau of Mines. Circle No. 24 for further information.

WHAT IS A DIESEL ENGINE: This question and many more questions on the operation and principals of the Cum-

Fill in numbers and mail this card for literature on products discussed in this issue.

To get further information on any item described in the Production Equipment Preview, note the key number of that item, write in the corresponding number on the PEP card at the right, and mail. If mailed from a point outside the United States, proper postage must be used.

PLEASE PRINT

This card may also be used to subscribe by filling in here

See other side for subscription rates

OCTOBER 1956 NOT GOOD IF MAILED AFTER DECEMBER 25

Please send me literature on products displayed at Metal Mining Show or described in regular PEP Section as indicated by numbers below.

Name ..... Title .....

Company .....

Address .....

Use this section to subscribe only

☐ New Subscription ☐ Renewal ☐ 1 yr. $5 ☐ 2 yr. $8

Name ..... Title .....

Company .....

Address .....

.....

mins Diesel engine are discussed in a new booklet recently published by the Cummins Engine Company. This extremely interesting and informative brochure goes into the theory of Diesel fuel systems, turbocharging, and comparisons against similar gasoline engines. For your copy Circle No. 25.

DEWATER AND CLASSIFY with the new, economical H.B. Large Company Duraclone. This rubberlined cyclone in conjunction with the model RU rubberlined sand pump insures efficient desliming and dewatering, at an initial cost lower than many comparable models. The Duraclone is fully guaranteed for a period of six months. Send for Brochure, circle No. 26.

SINTERING HEARTHS and small smelting plants are available from the Mace Company of Denver, Colorado. These items are described in new brochures recently made available by Mace. Investigate the possibility of installing your own smelter as a means of insuring higher profits. Mace sintering Hearths are also available for roasting and agglomerating fine materials. Circle No. 27.

MINERAL DRESSING NOTES No. 22 is the title of a new booklet published for you by the American Cyanamid Company. The 16-page manual contains practical suggestions and diagrams of feeder arrangements for feeding Aero Brand Cyanide, in both large and small mills. Circle No. 28 for your copy.

A NEW CATALOG published by the American Brattice Cloth Corp. describes their full line of ventilation tubing, rubber coated powder bags, and inflatable brattice with sizes available to fit any opening. Circle No. 29 for your copy of this informative brochure.

LOW COST DIAMOND DRILL: Stanco Manufacturing & Sales, Inc. has available for you a brochure on the lightweight X-Ray diamond drill. The drill, in the $1,700 bracket weighs approximately 205 pounds, is highly portable, and according to the manufacturer is capable of drilling down to 200 feet. Circle No. 30 for your copy.

CUT COSTS by lowering drill steel inventories. Dozens of different Timken rock bits, both multi-use and carbide insert, fit the same drill steel. They can be changed fast, right on the job. Timken has a variety of bits available for you, if you would like to know which ones fit your need, circle No. 32.

FILTER REDUCTION: Reduce the number of filters in your plant with new Eimco Agidisc filters. This filter produces a cake uniform in thickness over its entire surface, producing a cake with uniform dryness and has an even distribution of particle size. These characteristics have enabled several plant operators to reduce the number of filters in operation. Circle No. 33 for further information.

SIX CENTS A GALLON fuel savings have been realized by mine operators using the LeRoi Air Compressor. LeRoi compressors adapted to utilize LPG liquid propane gas have made these savings possible. Low repair costs on these compressors in conjunction with the use of LPG fuel, are making these compressors increasingly popular. Circle No. 34 for further information.

VERSATILE VEHICLE: The new four-wheel-drive Jeep is still proving its adaptability in all mining areas. From smooth two-wheel driving on paved roads, to hauling ore trailers underground in trackless mining. For further information on the versatile Jeep circle No. 35.

DIAMOND BIT CATALOG: A new catalog recently published by Sprague & Henwood illustrates and describes all types of oriented diamond coring bits, non-coring bits, casing bits, casing shoe bits, reaming shells, impregnated coring bits, etc. Circle No. 36 for your copy.

TWO NEW WAGON DRILLS: Two new air-driven wagon drills, featuring fully automatic controls grouped conveniently on a motor which can be repositioned along the mast, have been announced by the Thor Power Tool Company. Immediate availability is indicated. Circle No. 37 for details.

HEAVY MEDIA PUMP: The "Hazelton" Type "VN" pump was developed for circulating the media (magnetite or ferro silicon) in heavy density ore preparation systems. The absence of a bearing in the liquid eliminates the need for bearing lubricating water. Thus no dilution will occur. No stuffing box is needed. Circle No. 38 for further information.

ESCO CATALOG: A new edition of ESCO's Alloy and Stainless Steels catalog is now available for distribution by Electric Steel Foundry Co. The 102-page catalog contains corrosion resistant data, chemical composition, mechanical properties of corrosion resistant, heat resistant, impact and abrasion resistant alloy steels. Circle No. 39 for your copy.

NEW GEIGER COUNTER: Developed by the Atomic Research Corp. the Raytomic Arc 36 counter is a complete professional instrument for aerial, mobile, and portable prospecting. It has facilities for attaching a deep hole probe (up to 2,000 feet of cable); for recorder; and alarm system. Circle No. 40 for additional information.

SCREEN HEATER BULLETIN: F.R. Hanson & Sons announce the completion of a new three color illustrated folder of the Hanco Electric Screen Heaters, incorporating many improvements and new features for the efficient heating of wire screens by electricity. Circle No. 41 for your copy.

WALKING DRAGLINES: The new line of Page Single Deck Walking Draglines, in capacities from 5 to 15 cubic yards, introduces an entirely new concept in dragline design and power. The new line is designed to meet the increasing demands of operating conditions with need for lower operating costs. Circle No. 42 for further information.

MANUAL ON ROCK BLASTING: Publication of the third regular supplement to the internationally authoritative "Manual on Rock Blasting" was recently announced by Atlas Copco Eastern, Inc. The new supplement contains up-to-date information on blasting practice, compressors, percussion drilling, and tungsten carbide bits. Circle No. 43 for your copy.

NEW CONVEYOR SCALE: The latest model automatic conveyor scale developed by the Merrick Scale Mfg. Co., incorporates the all important feature of continuous Integration. The rugged Type "H" is extremely sensitive to load variation, and has steady no-creep zero balance. Circle No. 44 for details.

SCRAPER BULLETIN: Alloy Steel and Metals Co. have recently published a new brochure describing 11 models of Pacific "Slushmaster" Scrapers. The scrapers are illustrated and described from lightweights to heavyweights. Included are dimensional drawings and tables of weight, capacity, and approximate rope pull required. Circle No. 46 for your copy.

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT No. 3430, Sec. 34.9, P. L. & R. San Francisco, Calif.

MINING WORLD—WORLD MINING

121 SECOND STREET

SAN FRANCISCO 5,

CALIFORNIA

U. S. A.

For Free Product Literature see other side

SUBSCRIPTION RATES:

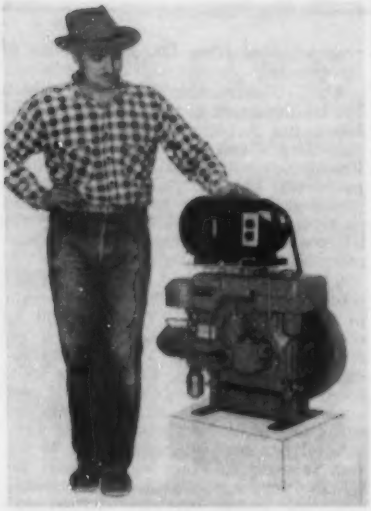
(Including the annual Review and Directory)

NORTH, CENTRAL AND SOUTH AMERICA:	one year $3 two years $5
OTHER COUNTRIES:	one year $4 two years $7

SUBSCRIPTIONS IN STERLING	Harold P. de Lacey MINING WORLD c/o Harold P. de Lacey Ltd. 884 Wilmslow Road East Didsbury, Manchester 20, England
one year 1/9/1 two years 3/16/0 three years 5/12/0	
CANADIAN CURRENCY:	MINING WORLD Royal Bank Bldg., Vancouver, British Columbia, Canada
one year $3 two years $5	

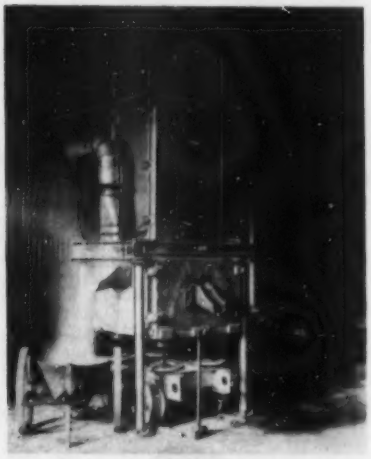
FOREIGN READERS NOTE:

The copy of World Mining you are receiving consists of carefully selected material from the complete American edition of Mining World to which the above subscription rates apply. If you would like to receive the complete Mining World, fill in the lower section of the reverse side of the card at the left. The card must carry proper postage if mailed from a point outside of the United States. You may send payment or be billed later.



Small Diesel Generator Produces Cheap Power

The Lynn Engineering Company of San Francisco has developed a unique type of Diesel generator plant. Called the "Power-Lite," the unit produces 2500 watts at 115 volts, 60 cycles, in a package weighing only 315 pounds. Cost of this unit is said to be lower than most gasoline generators of same output. According to the manufacturer, it costs as little as one half as much to operate, and will last up to ten times as long as a gasoline powered unit of same output. The plant delivers electrical and mechanical power simultaneously through extra power take-off sheabe for driving water pump or other V-belt driven equipment. For further information circle No. 76.



Mace Company Features Small Smelting Furnace

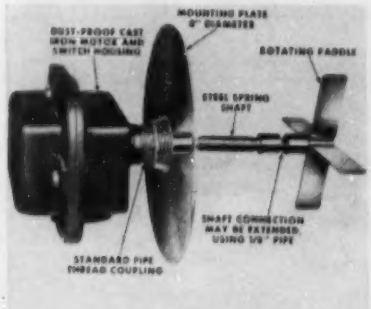
The Mace Smelting Furnace is a blast furnace with mechanical improvements which makes it practical to operate in small units as well as large ones. It is designed for operation in out-of-the-way places far from a base of supply, and according to the manufacturer, is a very rugged and substantial unit. The unit varies from old type blast furnaces in these ways:

1. Diametrically opposed rectangular tuyeres in place of circular tuyeres at regular intervals.
2. Adjustable tuyeres for regulating oxygen supply to smelting zone.
3. Has a removable crucible and an arrangement for keeping the crucible hot.

If your mill is at a considerable distance from a custom smelter, investigate the possibilities of a Mace Smelter at your operation. Circle No. 75 for further information.

Bottom and End Dump Features In One Wagon

According to the manufacturer, the C & D Movall Co., the Movall wagon is the only wagon with positive ejection and controlled dump or spread. With a capacity of 31 tons (25 yards heaped), the Movall does the work of both a bottom-dump and an end-dump wagon. The positive ejection scrapes mud, gumbo, frozen ore out clean, leaving no stuck material to cut payload. The unit is available with detachable sideboards on ejector for greater capacity when handling light materials, and also can be delivered with a detachable rock guard. Circle No. 74 for further information.


MOUNTING PLATE 6" DIAMETER
DUST-PROOF CAST IRON MOTOR AND SWITCH HOUSING
ROTATING PADDLE
STEEL SPRING SHAFT
SHAFT CONNECTION MAY BE EXTENDED USING 1/2" PIPE
STANDARD PIPE THREAD COUPLING

New Paddle-Type Bin Level Indicator Here

A new Roto-Bin-Dicator, a paddle-type bin level indicator for special installations has been introduced by the Bin-Dicator Co. This all-new unit is particularly adaptable to installations in bins under pressure or vacumm; bins, chutes or conveyors handling materials containing large lumps which tend to "bridge" over a diaphragm; and bins handling materials which tend to "rat-hole" and prevent operation of a diaphragm.

To circumvent these problems, the Roto-Bin-Dicator has a slowly rotating paddle, mounted on a flexible shaft. This projects into the bin and is driven by a small motor mounted in a housing outside the bin. Circle No. 77 for additional information.

Notes From The Manufacturers

ROBERT E. LANGE has been named to be manager of the Hyster Company's new manufacturing plant at Sao Paulo, Brazil. Mr. Lange has been Hyster's Washington, D. C. representative. He will be assisted in his new work by KENNETH E. GUPTILL, sales manager for Latin America, and MERRILL A. TURNER of the Peoria, Illinois Hyster factory will head production. The plant will occupy an area of 40,000 square feet and will supply Hyster-built materials handling equipment to overseas markets, supplementing the company factory at Nijmegen, The Netherlands, and a new plant in Glasgow, Scotland.

The Dwight-Lloyd Research Laboratory, largest and most complete minerals processes laboratory of its type in the United States, is now in full operation at the Dwight-Lloyd Division of McDowell Company, Inc. in Cleveland, Ohio. It is available to McDowell clients for developing engineering data covering size enlargement techniques in such materials fields as iron ore and other metallic ores, and some non-metallics.

Caterpillar Tractor Company will build a new plant in Aurora, Illinois, according to Harmon S. Eberhard, president of the company. Four models of Caterpillar machines will be made there: the D2 and D4 crawler tractors, and the two corresponding sizes of traxcavators, or tractor shovels. Caterpillar also plans to build additions to the plants in Decatur and Joliet, Illinois.

Fairchild Aerial Surveys, Inc. has formed a new Australian subsidiary, World Wide Surveys (AUST.) Pty., Limited. Actual flying operations will begin soon, according to Leon T. Eliel, Fairchild president. The company has also acquired Gray-McKinnon Surveys, Inc., an aerial survey firm of Tallahassee, Florida. This new division will continue to operate under the name Gray-McKinnon.

C & D Batteries, Inc., manufacturer of industrial storage batteries since 1906, has recently celebrated its 50th anniversary.

Charles M. Scholz is the new general manager of the Rubber Division, Thermoid Company, Trenton, New Jersey. Mr. Scholz is a vice president of the company and is continuing as director of marketing for all divisions and subsidiaries.

Lewis T. Barry, former editor of "Deco Trefoil" for the Denver Equipment Company, has joined the general sales department of Western Machinery Company of San Francisco in a sales coordinating capacity.

Philip J. Berg has been assigned to Dravo Corporation's home office in Pittsburgh to handle sales engineering of DeLaval blast furnace blowers and Dravo-Lurgi sintering plants.

Phelps Dodge Signs Exploration and Mining Agreement for California Zn-Cu-FeS Property

Phelps Dodge Corporation, the world's third largest copper producer, has signed an exploration and mining agreement with the Shasta Copper and Uranium, Inc. of Salt Lake City, Utah calling for a minimum expenditure of $150,000 per year for a five-year period on 250 mining claims in the West Shasta mining district, 15 miles north of Redding, California.

Other recent PD prospects, outside of Arizona, include uranium claims and leases north of Spokane, Washington, and uranium exploration in the Crooks Gap district of Wyoming (see MINING WORLD, page 56, May 1956).

Exploration in the West Shasta district will center around the famous old Balakalala, Shasta King, and Sugar Loaf mines.

Shasta Uranium has completed one DMEA surface drilling project in the Shasta King area, and a second DMEA drilling project is under way in the Balakalala area.

San Manuel Copper Corporation does not expect to attain full production before the end of this year. Experienced miners have not been available in sufficient numbers to meet the requirements of opening stopes as fast as anticipated earlier this year, says the company. Unskilled workers are available but require time to train.

A new geologic map covering part of Apache County, Arizona and San Juan County, New Mexico, adjacent to the Four Corners has been released by the United States Geological Survey. The map presents basic geologic information useful in continuing the search for oil and gas, uranium deposits, and supplies of ground water in the Four Corners region of the Navajo reservation. The geologic investigations resulting in this report were conducted by the Geological Survey partly on behalf of the United States Atomic Energy Commission.

Fairmont Minerals Inc. plans to build an ore processing plant at Four Corners, California, seven miles east of Boron. The San Bernardino County Planning Commission has already approved a change in zoning requirements to permit the new facility. The company is now drilling for water, and then expects to undertake the $100,000 construction job. Fairmont Minerals owns copper, antimony, and iron properties north of Trona, and has acquired selenium and lithium properties in Nevada, according to Herbert H. Schisler, secretary. Reportedly, they are mining the antimony deposit at present, and doing development work at the iron and copper properties. An associate company, *H and Z Mining Company*, is mining copper and tungsten in Nevada. President of the firm is L. A. Thomson of Pasadena. The land for the plant site was acquired from Dr. James Gillis of Beverly Hills.

Utah Construction Company, which has headquarters in San Francisco, California, has recently leased a building in Palo Alto, about 35 miles south of San Francisco, for its metallurgical design department. The company's research department is already in Palo Alto, and there is speculation that the firm might be considering construction of permanent metallurgical headquarters there.

The Bureau of Land Management has released 230,000 acres of public domain in southern California. The land will be open to mining location beginning on November 18. Formerly held under reclamation withdrawal, these lands were then open to mineral leasing but not mining location. The restored lands are steep, rugged, and without value for agricultural purposes, generally; none of the land is timbered, but portions may be valuable for such minerals as manganese, gold, and silver. Inquiries may be addressed to the Manager, Land Office, Bureau of Land Management, Los Angeles, California.

Consolidated Virginia Mining Company, which recently announced plans for reactivating its extensive holdings on the Comstock Lode, Virginia City, Nevada (see MINING WORLD, September 1956, page 145), has opened an administrative office at 155 Montgomery St., San Francisco, California. Anson S. Bilger, a director of the company, will be headquartered there.

A Salt Lake City, Utah group have taken over the old *Socrates* mercury mine north and east of Santa Rosa, California and expect to be in production shortly. Frank E. Moss is trustee and general partner, while limited partners are E. A. Peasy; Adiel F. Stewart, Leonard Moretz of Maiden, North Carolina, and Dr. William Moretz of Augusta, Georgia.

The *Owen Mining Company* has made its first shipment of uranium ore from the *West Side* mine near Midway Peak in the Temblor Range of California. The claims are at an elevation of 2,600 feet.

The United States Geological Survey's new budget for fiscal year 1957 provides funds for additional building construction at the Survey's Pacific Coast Center in Menlo Park, California. Some new field investigations also will be undertaken in this period. The Mt. Pinchot area is to be mapped, and also a strip of country west of the Shasta copper mining district. Both of these properties will be done in cooperation with the California Division of Mines.

Crystal Silica Company of Oceanside, California has been purchased by *Ottawa Silica Company* of Ottawa, Illinois, according to G. A. Thornton, president of both firms.

Pima Stripping Makes Steady Progress

The photograph above, taken by a MINING WORLD staff member, shows the progress of Pima Mining Company's open pit, 15 miles south of Tucson, Arizona. The depth of the pit at the time of the photograph was approximately 175 feet below the collar of the original Pima shaft, and about 25 feet above the bedrock. From 25 to 50 feet of barren rock must be removed before the ore is reached. Utah Construction Company, one of the three major owners of the Pima property, is presently removing approximately 1,000,000 cubic yards of overburden per month. The state of the overburden is such that very little blasting is necessary to break it. Digging or mucking is done with power shovels and scrapers. The 3,000-ton-per-day concentrating plant is scheduled for completion in November. Ore extraction should start in the middle of October, and this will probably involve stockpiling from the pit until the mill starts.

The *United States Lime Products Corporation* is building a modern secondary crushing and screening plant at Henderson, Nevada which, when completed later this year, will bring its Sloan plant up to modern design and efficiency. This plant crushes and calcines the quarried dolomite.

National Lead Company and *Allegheny Ludlum Steel Corporation*, parent companies of the *Titanium Metals Corporation of America*, plan an additional expansion of titanium metal production facilities at Henderson, Nevada. Sponge output is to be increased 50 percent and related melting facilities for production of titanium ingots are to be expanded 80 percent. Earlier this year the companies announced a 67 percent increase over the original plant output of 10 tons per day. When completed late next year, total capacity of the Nevada operation will be 25 tons of titanium sponge per day or 9,000 tons per year, and 11,000 tons of titanium ingots per year. Total annual consumption of titanium by 1958 is now estimated at 30,000,000 pounds of finished mill products, compared with a total of less than 4,000,000 pounds in 1955. Overall cost of the additional facilities is estimated at $15,000,000.

Getchell Mine, Inc. is currently constructing a small pilot plant adjacent to the acid leach plant at Red House, Nevada. The plant is designed to investigate the production of synthetic scheelite and other tungsten products.

For the first six months of 1956, *Standard Slag Company* shipped an average of 40,000 long tons of iron ore per month from its properties near Gabbs, Nevada. All of this went to Japan, through the Port of Stockton, California. Current shipments are from the *Stokes* mine near Gabbs, at the *Minnesota* mine 16 miles from Yerington.

Two lessees, C. C. Coppin and G. J. Harrison, are retorting high-grade cinnabar ore from the *Redbird* mine in the Antelope Springs area near Lovelock, Nevada. Two tube retorts are being used. There are 60 tons of ore on the dump as a result of development work done under a government loan, completed in July. Drifts have been driven on the haulage level to a total of 320 feet. A winze has also been sunk from that level a distance of 75 feet, and a drift driven from it for 58 feet. At the end of the drift a two-foot face of ore was encountered which is being mined. Lower grade ore has been found on the uper level.

Gerald Hartley, mining engineer of Reno, Nevada, has made recent shipments of uranium ore from his *DeLongchamps* property in the Virginia Range near Pyramid Lake, Nevada. The ore occurs in a rhyolite tuff, along a basic dike which strikes across the rhyolite. Most commonly held belief concerning origin of the ore is that it was leached out of igneous rocks above and redeposited as secondary minerals in favorable locations. Much of the higher rock has been eroded away since leaching out.

Marion Fisher of Battle Mountain, Nevada has taken a 10-year lease and option on the *Morning Jewel* tungsten mine on Mount Tobin, about 65 miles southwest of Battle Mountain. Work has started on a new road to the property. Frank and H. E. Waller of Lovelock, and Ted Johnson and Blain C. Holt of Battle Mountain were the sellers.

The *Uranium Exploration & Copper Company* of Las Vegas, Nevada plans to reactivate an old cinnabar mine in Sheep Canyon four miles south of Ione in Nye County. A large furnace, washing plant, and related equipment will be installed. President and general manager is Jefferson H. Fawcett of Las Vegas; vice president is Ross Greeley of Balboa, California.

NEW MEXICO

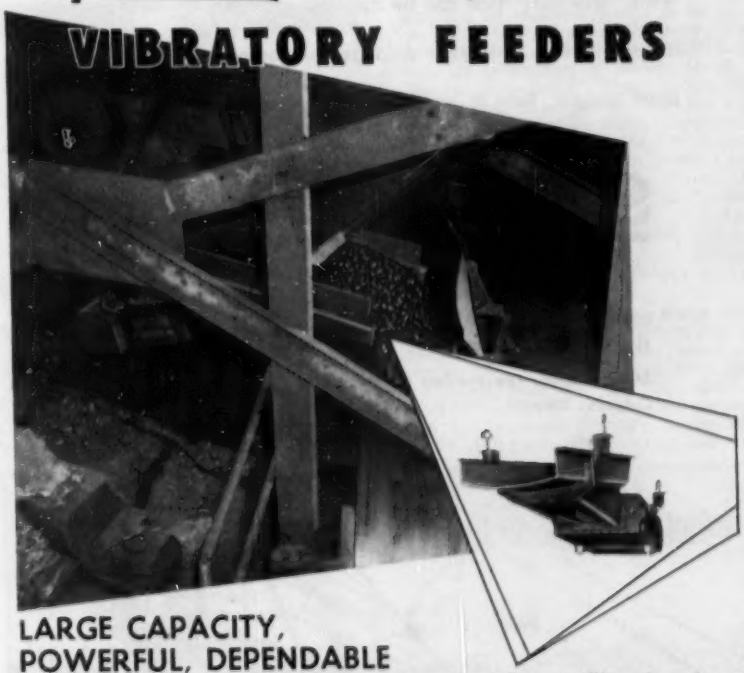
A $200,000 copper leaching plant is being constructed by *Meader Corporation* of San Antonio, Texas near Scholle, New Mexico. The 200-ton-per-day plant should be complete shortly. Concentrates will be shipped to the *American Smelting and Refining Company's* smelter at El Paso, Texas.

Tefano Mining Company expects to start shipping copper ore from its open-pit *Austin Amazon* mine very soon. A crusher and mill will be installed on the property, located about 11 miles west of Tyrone, and copper concentrates will be shipped from Silver City to the ASARCO smelter at El Paso, Texas.

Shattuck Denn Mining Company has decided to sell its 400-ton-per-day, acid-grade, fluorspar mill at Las Lunas, New Mexico. The mill had been forced to close because of low market prices of acid-grade fluorspar.

George A. Mellen, president of *Paul McDaniel, Inc.*, has announced that his firm has purchased a 15 percent royalty interest in Kermac's Ambroisa Lake property. Mr. Mellen says that Kermac Nuclear Fuels Corporation expects to start soon on two mine shafts to cost

SYNTRON VIBRA-FLOW VIBRATORY FEEDERS



LARGE CAPACITY, POWERFUL, DEPENDABLE

By providing the simplest and easiest means of controlling its rate of feed, SYNTRON VIBRATORY FEEDERS delivers a steady flow of bulk materials to belt conveyors, screens, picking tables, etc. Handling almost every kind of material from large lumps down to fine powders—damp or dry. Its rated capacity can be utilized to maintain high production schedules. SYNTRON VIBRA-FLOW FEEDERS use the simple electromagnetic principle which assures long dependable service and maintenance economy.

Other Syntron Equipment of proven dependable Quality

ELECTRIC VIBRATORS

a-c to d-c POWER CONVERSION UNITS

GRIZZLY BAR SCREENS

Write for Complete Catalogue Data—FREE

SYNTRON COMPANY
166 Lexington Ave. Homer City, Penna.

all from *this* one source

Mine surface facilities, concentrators, smelter—all these are available from one reliable source: Stearns-Roger. Through all steps: design, engineering, fabrication, procurement, field erection and testing, S-R engineers and crews are familiar with the new procedures and the worthwhile "shortcuts" that can be applied to plants large or small. For your enlargement or new plant project, *take it up with*

Stearns-Roger

DENVER • HOUSTON
EL PASO • SALT LAKE CITY
Stearns-Roger Engineering Company, Ltd., Calgary, Alberta

over $750,000 each. The location is less than a mile and a half south of the Mid-Continent Mine, operated by Rio de Oro Uranium Mines, Inc., and is immediately east of Sabre-Pinon's property.

St. Anthony Uranium Corporation of Albuquerque, New Mexico, a wholly owned subsidiary of *Climax Molybdenum Corporation*, has announced it will sink a 294-foot shaft on the Seboyeta Grant, a few miles north of *Anaconda Company's Jackpile* mine.

Gibraltar Uranium and Oil Corporation reports it has a contract with *Kerr-McGee Oil Industries, Inc.* to purchase vanadium-bearing ores or liquors from its Shiprock, New Mexico processing mill. *Associated Metals & Minerals Corporation* of New York will market. The material is used in the steel industry.

Tide Water Associated Oil Company and associates are reported to have spent over $400,000 on exploratory drilling for uranium in New Mexico and to have set aside $1,000,000 more for the purpose. Tide Water has two associated companies; *Skelly Oil Company* and *Getty Oil Company*. Work so far has been concentrated in the Smith Lake area in northern McKinley County.

Two companies are apparently going ahead with plans to establish multi-million-dollar cement plants in New Mexico. *Permanente Cement Company*, a Henry J. Kaiser affiliate, was first to announce plans to build a plant at Scholle, in central New Mexico, south of Albuquerque. A week later, the *Dewey Portland Cement Company* of Kansas City, Missouri obtained acreage at Placitas, north of Albuquerque. Both companies are talking in terms of $10,000,000.

TEXAS

The *Federal Facilities Corporation* is calling for bids for purchase or lease of the government-owned Longhorn tin smelter and chemical plant at Texas City, Texas. The FFC is prepared to handle inqueries for the purchase or lease of the smelter alone, or for the smelter with one or both of the other assets of the government's tin program—a chemical plant presently used for recovery of hydrochloric acid and an inventory of tin-bearing materials. Proposals may be filed before November 2. Contact W. F. McKinnon, Director, Office of Tin, FFC, 811 Vermont Avenue, N.W., Washington 25, D.C. The smelter's current production is about 20,000 long tons; its maximum rate of 43,450 long tons was achieved in 1946.

Aluminum Company of America will construct a seventh potline at its Point Comfort, Texas aluminum plant, adding 20,000 tons to that operation's present capacity of 120,000 tons of metal annually. The new line should go into operation in January 1958.

Balcones Exploration and Mining Corporation has purchased *Southwest Assays, Inc.* at San Antonio, Texas. Southwest will become the wholly owned subsidiary and its first major job under the new ownership will be to assay some 250 ore samples for Balcones which came from the latter's properties in Arizona. Fred LeLaurin, chief chemical engineer, will continue to supervise the laboratories.

Olin Mathieson and Revere Copper & Brass Form $231,000,000 Firm To Produce Primary Aluminum

A $231,000,000 company has been formed jointly by Olin Mathieson Chemical Corporation and Revere Copper and Brass Inc. to produce 180,000 tons of primary aluminum annually. To be called the Olin Revere Metals Corporation, its president will be Walter F. O'Connell, who will also continue as executive vice president in charge of Olin Mathieson's aluminum program. Ownership of Olin Revere will be on a 50-50 basis.

Olin Mathieson has contracted with Olin Revere on a long-term basis for 120,000 tons of primary aluminum a year —twice the amount the corporation was to produce under its original program for entering the primary aluminum industry. Revere has made a similar contract with the new company for 60,000 tons a year.

Facilities of Olin Revere Metals Corporation will include:

1. An alumina plant with a capacity of 350,000 tons per year. This plant will be built on a site still to be selected near the Gulf Coast on deep water transportation.

2. A reduction plant with 180,000 tons per year capacity, which is now under construction at Olin Mathieson's original aluminum site near Clarington, Ohio. Previous Olin Mathieson plans called for a 60,000-ton reduction plant. Capacity production is expected to begin late in 1958 with some production before then.

3. A new power subsidiary wholly owned by Olin Revere, which will own two 225,000-kilowatt generating units in a new power plant at Cresap, West Virginia. These units will supply power to the reduction plant. A third 225,000-kilowatt unit at the power plant will be owned by Ohio Power Company, a subsidiary of American Gas and Electric Company. All three units will be operated by Ohio Power.

Arrangements have been made to provide the bauxite supplies required by an aluminum operation nearly three times the size of that originally planned. Bauxite will be furnished from the Surinam, Dutch Guinea, mines of N. V. Billiton.

The Certificates of Necessity covering the 60,000 ton operation originally planned by Olin Mathieson have been transferred to the new corporation by the Office of Defense Mobilization.

Kennecott Uses Horizons Zirconium Processes

Kennecott Copper Corporation will begin design and construction shortly of a new test plant in the Cleveland area to produce zirconium, with operation to be underway late next year. Licensing arrangements have been made with Horizons Titanium Corporation of Princeton, New Jersey, whereby Kennecott has acquired licenses for the electrolytic production of zirconium and its by-product, hafnium.

The agreement with Horizons Titanium also provides Kennecot with options for licenses for electrolytic production of other metals, including titanium, thorium, columbium and tantalum. Horizons Titanium Corporation is an affiliate of Horizons, Inc., which has been working in the research and development field of processing the newer metals by the fused electrolytic method for the last several years.

Horizons, Inc. recently received a $200,000 development contract from the Navy Bureau of Aeronautics for a one-year program for development of a commercial method of producing titanium by an electrolytic process. Horizons claims it has developed in the laboratory a process for producing titanium at lower cost than the present Kroll method. The new process is a modification of the original fused salt electrolysis process, and produces coarse granules rather than sponge.

The *Algomah Mining Company* of Ontonagon, Michigan has started making shipments of copper ore from its property 17 miles east of Ontonagon. The firm started its operations in September 1955, and operated throughout last winter. Production has been from the first level. The second has now been dewatered and operations will be started here soon. The property is entered by an incline shaft 114 feet from the surface to the first level. Ore is chrysocolla, cuprite, and tenorite, occurring in fissures and pocket type deposits. The mine is equipped with a Diesel power plant, hoist loading bin, and a truck to haul the ore four miles to a railroad loading ramp.

Republic Steel Corporation will undertake an $8,000,000 expansion of its titanium melting, preparation, forging, and laboratory facilities at its plants in Canton and Massilon, Ohio. This is expected to increase the company's capacity for titanium and titanium alloy products to about 12,000,000 pounds annually. Present capacity is about 3,000,000 pounds. The initial phase of the program is to be completed this fall, with the final overall expansion completed by late next year. Major facilities in the expansion are 12 vacuum double melt consumable electrode melting furnaces. Of these, eight will be first-melt, and four second-melt.

The ODM will soon make a new evaluation of its titanium program. So far, domestic production seems to have kept well ahead of consumption. Most of the surplus is going into government inventory. Total production for the year July 1955 through June 1956 was 8,803 tons. Imports for consumption were 901 tons, and consumption was 6,656 tons.

The DMEA has issued several recent contracts for exploration work in the eastern states. In Tennessee, *New Jersey Zinc Company* has received a $107,150 contract for exploration of zinc in Hawkins County; government's share is $53,575. In Virginia, New Jersey Zinc has also received a contract for zinc exploration in Smyth County totalling $44,800; government's share is $22,400. In North Carolina, mica exploration is the commodity. Contracts have been granted to *Carolina Mining Company*—$3,828, Jackson County; C. R. Phillips—$5,488, Mitchell County; Ed Huskins—$3,553, Mitchell County; and Sam L. Phillips—$4,016, Mitchell County.

Engineering studies are being completed for *Continental Uranium, Inc.* for alterations and improvements which will double milling capacity of its silica plant in Marion, Kentucky. The firm expects to start rebuilding as soon as final drawings can be prepared. Further confirmation of the high-grade silica reserves in the de-

Jefferson City Mill Starts Operation

Construction of the 1,000-ton-per-day zinc flotation mill of New Jersey Zinc Company's new Jefferson City, Tennessee, operation was completed in August, and initial production is scheduled for this month. Mine development was started in October of 1953. The main hoisting shaft is 1,302 feet in depth and has 7 compartments (19 by 13 feet). Ventilation is provided by a 12-foot-diameter circular shaft 1,217 feet deep. The deposit consists of a disseminated ore body in a flat-dipping dolomite formation. Ore will be mined by open room and pillar methods from 6 levels at 50-foot intervals starting at the 938-foot level. Tractor-mounted, 3-drill, jumbos will be used for drilling and "Gismos" will handle mucking. Howard W. Miller is superintendent; J. E. Nelson is mill chief; and R. L. Sayrs is mine chief. Johnson Crawford is superintendent for New Jersey Zinc's Tennessee operations.

posit indicate a 50-year supply, according to the firm. A number of larger consumers of high-grade silica sands are located within favorable shipping distances of Marion, and Continental is negotiating with them for sale of its output.

Operation of the *Hunner* mine of the M. A. Hanna Company has resumed. The mine went into production shortly before the steel strike and then was forced to close down. At present the wash section and heavy media sections are operating, and construction of a cyclone section is progressing. It now appears that this latter section will not go into operation until 1958. The plant is located in Coleraine, Minnesota.

Construction of two new ore treatment plants has started. The *Mahoning Ore Corporation* is building a wash, heavy media, cyclone, and spiral treatment plant in Hibbing, Minnesota, while the *Jones & Laughlin Steel Corporation* is erecting a spiral and flotation plant in Calumet, Michigan. Both plants are scheduled for initial operation in April 1958. The latter plant is the first large-scale flotation plant to be constructed on the Mesaba Range.

As of the first week in September, the Great Lakes ore fleet had moved about 43,000,000 tons of ore compared with 56,000,000 tons at the same time last year. The fleet hopes to bring down about 75,000,000 to 80,000,000 tons before the end of the season, barring any serious tie-ups. In addition to the steel strike that began July 1, U.S. Steel Company's Pittsburgh Steamship Division was hit by a maritime strike in early August which idled 55 of the 58-boat fleet.

New Jersey Zinc Company's Sterling mine at Ogdensburg, New Jersey which had been idle for a year because of a strike, has now reopened. At the time the strike was called, the development and construction program designed to double production from this mine, was on schedule.

Bethlehem Steel Corporation's Lackawanna plant near Buffalo, New York has received the longest Great Lakes ore carrier ever to enter the Buffalo harbor. The 684-foot vessel, the "Scott Misener," also delivered the largest cargo of ore ever received there—22,465 tons. The Canadian freighter is operated by *Colonial Steamship Lines, Ltd.* It was the first time the freighter had ever carried ore. It was used to help the mill to rebuild stocks lost during the recent steel strike.

Lawson Feldspar & Minerals Company has started construction of the first unit of its new modern flotation plant at Minpro, North Carolina. The plant will be designed to recover feldspar and other minerals from alaskite ore. Alaskite is the common name for Carolina pegmatitic granites. Minerals, in order of abundance, are oligoclase, quartz, microcline, and muscovite. The new plant will have a rated capacity of 10,000 tons of feldspar concentrate per month. Mr. Lawson acquired the site of the former *United Feldspar & Minerals Corporation* plant in 1955. The plant had burned down several years earlier. Part of the purchase included the alaskite deposits which have since proved to be ample to supply the new plant indefinitely. Arrangements have also been made to obtain from the I. H. Bailey estate any additional ore that may ever be needed if plant capacity is expanded.

Woodward Iron Company has reduced the sum originally announced earlier this year for expansion of its mines. The reduction is the result of the firm's recent purchase of the *Muscoda* iron mines of *United States Steel Corporation's Tennessee Coal & Iron Division.* (See MINING WORLD, June 1956, page 105.) The company had planned to develop its ore properties at Wildwood, Alabama, but purchase of the Muscoda properties has delayed opening of the Wildwood mine for 10 or 12 years. A planned $3,000,000 expenditure for construction of a sintering plant has also been postponed until tests have determined what kind of sintering plant will be best for the Muscoda ores.

National Lead Company has sold its first lots of metallic nickel from its new Crum Lynne refinery in Pennsylvania. Nickel oxide sinter from the government-owned plant at Nicaro, Cuba, operated by a subsidiary of National Lead, supplies the basic raw material for the Crum Lynne operation. Production is steadily increasing and should reach full capacity by the end of this year.

"Our X-RAY can take core samples at any point to 200 feet"

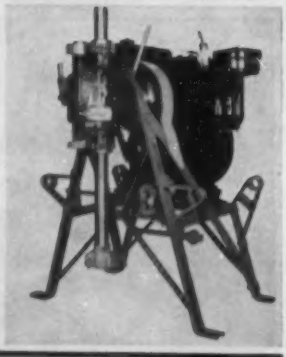
Say Jack Breham and Bob Murray, Career Prospectors about their

X-RAY DIAMOND DRILL

Jack Breham and Bob Murray of Culver City, California, together with Jim Burns, are career prospectors. In addition to being contract drillers, they are currently working a series of their own uranium claims in the Big Bear region of the Golden State.

The partners bought an X-RAY Diamond Drill at the time they went together. They picked an X-RAY after talking to other miners and claim operators, who nearly all agreed the X-RAY was the best available Diamond Drill of its size.

"Our X-RAY Drill can easily go to 200 feet," says Mr. Breham, "and we can take core samples at any point. I think it is the only Drill for light drilling, especially because it is easy to break down and pack into the claim. Our Drill uses little gasoline and is economical, mainly because we've never required repairs. When we need another Drill of the same size, it will be an X-RAY"



CHECK THESE X-RAY FEATURES

- Low cost — $1700 bracket
- Light weight — as little as 205 lbs.
- Economical — 7 hp gasoline motor or air motor powered
- Highly portable — can be truck, jeep or skid mounted. Breaks down into 100 lb. components.
- Drills in any position to 360° radius.
- Complete with water pump and 2-speed head.

SEND THIS COUPON

To: Stanco, Inc., 1931 Pontius Ave. Los Angeles 25, California

PLEASE SEND US FREE LITERATURE ON X-RAY DIAMOND DRILLS.

Name_____

Address_____

City_____, State_____

Write your nearest Distributor, below, or STANCO, INC. for the name of your local Dealer.
GEORGE E. FAILING CO., 421 E. Randolph, Enid, Oklahoma; Houston, Texas; Midland, Texas for Oklahoma, Texas, Louisiana. WASATCH EQUIPMENT CO., 323 W. 14th South, Salt Lake City, Utah for Utah, Idaho, Wyoming and Montana. TIMBERLAKE COMPANY, 433 West Colfax Avenue, Denver, Colorado for Colorado.

Stanco
MFGS. & SALES INC.
1931 PONTIUS ST., LOS ANGELES 25, CALIF.

IDAHO

Day Mines, Inc. of Wallace, Idaho is considering a 600-foot shaft-deepening project to get added depth on the Rambler vein in its *Hercules* mine. The structure has been developed mainly through raise work from the 1600-foot level. At the firm's *Dayrock* mine, 1100 level development has disclosed better ore than on the two preceding higher levels. Henry L. Day is president.

American Smelting and Refining Company, lessee of the *Galena* mine west of Wallace, Shoshone County, Idaho, has extended the old Callahan winze to the 2400 level, providing an auxiliary service shaft. The company currently is mining and milling between 350 and 375 tons of silver-copper ore daily from the vicinity of the 3000 level. J. C. Kieffer is general manager.

Nabob Silver-Lead Company is milling development ore from winze-sinking operations at its property in the Pine Creek district of the Coeur d'Alene mining region, Shoshone County, Idaho. At last report, millheads were running about 14 percent combined lead and zinc plus three ounces of silver to the percent of lead. Plans called for continuing the winze to the 380-foot point and establishing working levels at the 180- and 360-foot points. H. J. Hull of Wallace is president and C. C. Dunkle of Kellogg is vice president and managing director.

Lucky Friday Silver-Lead Mines Company's 2,300-foot level east of Mullan, Shoshone County, Idaho, is being extended westerly into adjoining *Gold Hunter* ground leased from *Day Mines, Inc.* After the Lucky Friday vein structure is explored in Gold Hunter ground, a northerly crosscut will explore *Lucky Friday Extension Mining Company* ground under a profit-sharing agreement. Charles E. Horning of Wallace is president.

The John George leasing operation in upper workings of the *Bunker Hill* mine at Kellogg, Shoshone County, Idaho and George's flotation mill in Wardner Gulch have been taken over by Frank N. Marr, Spokane, Washington mining man. He is rehabilitating both mill and underground workings with a view of increasing the current output of 60 tons daily. Some custom milling also may be done. About 25 men are employed.

Polaris Mining Company is nearing completion of a two-mile, below-sea-level, exploration tunnel easterly from its *Silver Summit* mine in the Silver Belt of the Couer d'Alene mining region in Shoshone County, Idaho. At last report, about 700 feet of tunnel remained to be driven in ground of *Rainbow Mining and Milling Company*. L. J. Randall, Wallace, is company president.

Fire destroyed the mill, ore crusher, and ore bins at the *United Mercury* mine near Stibnite, Idaho for a loss estimated at $150,000. Seventy women and children were evacuated from camp without injury. The blaze spread from the slag pit. The property was purchased early this year by *Holly Minerals Corporation*.

Oxford Mining Company has appointed Melvin Snook of Orofino, Idaho as mine manager and is planning to start operations soon.

An additional $8,270 worth of exploration at the *Deer Trail* zinc-lead property in Custer County, Idaho has been authorized by the DMEA. Its original contract with *Highland-Surprise Consolidated Mining Company* called for $59,570 worth of exploration. Bulldozing and diamond drilling are planned along an indicated extension of a lead-zinc ore zone blocked out by the earlier work. *Sunshine Mining Company* is a partner in the venture. Frank J. Luedke, Spokane, is president of Highland-Surprise.

Clay deposits in Latah County, Idaho are estimated at between 250,000,000 and 500,000,000 tons by the Idaho Bureau of Mines and Geology. Other northern Idaho counties also have deposits of clays which have potential value as sources of alumina and ceramics. The area's total production has been about 250,000 tons, mostly for refractory products.

MONTANA

The Defense Minerals Exploration Administration has signed a contract with *Burmac Exploration Corporation* of North Dakota to do $15,512 worth of exploration at the *Cox* uranium lease in Fallon County, Montana.

Recent development work at the *St. Paul* lead property near Libby, Montana has increased ore reserves to an estimated 4,500 tons. At last report, an ore bin was being installed preparatory to shipping a car of high-grade to the *Bunker Hill* smelter at Kellogg, Idaho. *Oro Mining Syndicate* of Kellogg and *Silver Star Mines, Inc.*, of Wallace, Idaho, are associated in the enterprise.

Fluorspar has been discovered at the head of Fish Creek in southern Mineral County, Montana by Mort Bacon and he and his associates have filed on 10 claims.

Western Resources, Inc. of Spokane, Washington, has staked 14 mining claims adjacent to the 20 uranium claims it acquired a year ago two miles east of Saltese, Mineral County, Montana. Additional bulldozer stripping is planned of a mineralized zone partially opened over a 225-foot strike length, with drilling to follow. *Yreka Mining Company*, with holdings in the Coeur d'Alene mining region east of Kellogg, Idaho, is financing the work through purchases of optioned Western Resources' stock. Wellman Clark, Spokane attorney, is president of Western Resources.

Al Stovall who erected a gravity plant to treat black manganese concentrates in the Butte area of Montana, has shut down the operation and moved from the state. Most of the ore on the outcrop at the *Zarina* claim was treated in this plant.

Uranium Corporation has taken a lease and option on the *Daly* property in Wickes, Montana. The company is now dewatering the shaft and they are preparing the property for base metal production.

At the *Centennial* phosphate mine of *J. R. Simplot Company* near Lakeview, Montana, exploratory drilling has established the existence of 30,000,000 tons of acid grade ore. It is planned that 5,000,000 tons will be mined by an open pit operation, and the remaining 25,000,000 tons by underground mining. When the tunnel phase of the operation starts it will be one of the largest underground phosphate operations in the West.

OREGON

The Wah Chang Corporation has entered into an agreement with the Federal

Golden Anchor Operates New 50-Ton Plant

Golden Anchor Mining and Milling Company has placed this 50-ton concentrator in operation at its gold-silver-lead property near Ellisten, Montana. Equipment includes a Pugh Gyre-Matic mill, which combines the actions of an old Spanish arrastra and a stamp mill. The plant is powered by a Diesel-electric generator. Present milling is from approximately 12,000 tons of dump ore having mainly gold values; a so-called "blanket vein" of gold, silver, and lead; and "gob" which is now available through the new adit. In the near future, the company plans to operate on a 24-hour basis, at which time new units will be added to increase the capacity, and mining of the main Big Dick-Blackjack vein will be started.

A NEW CARBON FOR ORE PROCESSING

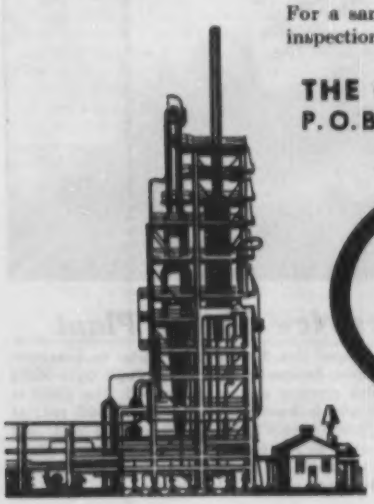
CARTER *FLUID* COKE

Here is an entirely new source of carbon in microspherical form. This is *fluid* coke, a product of The Carter Oil Company's Billings, Montana, refinery.

With approximately 90% fixed carbon and one-tenth of 1% ash, *fluid* coke might very well play an important part in your processing operations if you are concerned with non-ferrous metals. Preliminary investigations with far-sighted processors have already indicated that new economy can result from the use of *fluid* coke.

For a sample of Carter *fluid* coke with detailed inspections, write on your company letterhead to:

THE CARTER OIL COMPANY
P. O. BOX 2514, BILLINGS, MONTANA



Carter

Carter fluid coke is a product of the world's first fluid coking plant.

government to operate the Bureau of Mines zirconium plant at Albany, Oregon. Under a contract with the AEC, Wah Chang will produce about 300,000 pounds of high-purity zirconium sponge annually for at least two years. If demand increases, Wah Chang may also construct a larger plant of its own in that area.

The newly formed *Oregon Metallurgical Corporation* will operate a plant for the production of titanium and zirconium ingots and castings. Other metals, such as hafnium, tantalum, and columbium, may be included.

The *Code Mining Company* has been formed to develop the *Paramount* claims on Greenhorn Ridge about 15 miles west of Sumpter, Oregon. The claims were leased from Ingleman Helmer, and a rotary retort has been installed. President of the firm is R. E. Combs, and A. J. Denis is secretary-treasurer.

The *Digmore* mercury claims in Lake County, Oregon are being developed by John and Weyland Roush of Lakeview who are also part owners of the *White King* uranium mine.

Researchers at the U. S. Bureau of Mines' laboratory at Albany, Oregon have found that adding salt to a 130-year-old formula utilizing chlorine to separate metals from ores provides simple, low-cost production of tantalum, titanium, and columbium from black sands. Compounds of uranium, thorium, iron, and rare earths are left over. Sands from Bear Valley, Idaho, were used in the experiments.

Sam Arentz has reportedly joined with the *Shawano Development Corporation* in the development of a mill for the *bretz* mercury property, Malheur County, Oregon. Under an agreement, Mr. Arentz plans to construct a 70-ton-per-day reduction plant and operate it on a profit sharing basis with Shawano. He will be mill manager; Jay A. Carpenter will be consulting engineer; and J. P. Hart will continue to represent Shawano interests. The Bretz mercury mine was discovered in 1931 by William Bretz who leased it to the *Bradley Mining Company*. The latter mined it until about 1937. A new discovery was made by Mr. Bretz in 1940, which was also mined. In recent years the claims have been relocated by John Ruiz who in October of 1955 leased the property to *United States Mercury Corporation* of New York with Jay Carpenter as intermediary. U. S. Mercury, in turn, holds stock in Shawano Development Corporation.

WASHINGTON

Western Knapp Engineering Company of San Francisco, California has started construction of a $3,000,000, 400-ton, uranium processing plant at Ford, 40 miles northwest of Spokane, for *Dawn Mining Company, Newmont Mining Corporation* subsidiary. The plant is expected to start operations next summer. Dawn also has awarded a contract to *Isbell Construction Company* of Reno, Nevada, for stripping 231,000 tons of waste from a uranium deposit drilled on its *Boyd* lease adjoining its *Midnite* uranium mine on the Spokane Indian Reservation. Robert B. Fulton, Spokane, is Dawn manager.

Midnite Mines, currently operated by *Newmont Mining Company*, has awarded a 300,000-ton stripping contract to *Isbell Construction Company* for work at its *Midnite* uranium mine in the Spokane area of Washington. Isbell is already stripping and mining for the *American Smelting and Refining Company* at Van Stone, about 50 miles away.

Percussion drilling is yielding favorable results for *Northwest Uranium Mines* in the Spokane Indian Reservation, southwestern Stevens County, Washington. At the two-thirds point in a $29,180 DMEA exploration contract, indicated ore was estimated at more than 400,000 tons averaging 0.15 percent uranium oxide. Dr. F. E. Scott, Wallace, Idaho, is president.

Operation of *Germania Consolidated Mines'* tungsten property in the Spokane Indian Reservation has been taken over by *Lucky Scarlett Uranium Mining and Development Company* of Spokane. Plans include addition of equipment to improve mill recoveries and grade of concentrate. Profits will be shared equally. William Travis, Davenport, will direct operations. Charles M. Mashtare is Lucky Scarlett manager.

In northern Spokane County, *National Uranium Corporation* of Wallace, Idaho, started diamond drilling to obtain cores of a mineralized zone indicated by wagon drilling. The zone is about 25 feet deep. Roy H. Kingsbury is company secretary-treasurer.

National Silver-Lead Mining Company of Wallace, Idaho, has made preliminary arrangements to explore for uranium on ground leased from *Northwest Uranium Mines* in the Spokane Indian Reservation, southwestern Stevens County, Washington. Piatt Hull is secretary.

Columbia Lead and Zinc Mining Company's 500-acre holdings north of "Z" Canyon in Pend Oreille County's Mining District have been purchased by *Uranium Lead Zinc Mines, Inc.*, for 500,000 shares of stock. The new firm also has leased two uranium prospects in the Mount Spokane uranium district, northern Spokane County. Herbert W. Carlson, Dishman, is president of the new firm, which is capitalized for $300,000.

Northern Development Company has announced plans to build a shale quarry and processing plant near the southwest city limits of Spokane. Shale would be stripped, ground and heated to produce lightweight aggregate for use in Spokane's new Maple Street Toll bridge and activated pozzolan for the proposed Priest Rapids, Dam. James K. Johnson is company president and W. B. Chandler, company attorney.

Sodium sulphate mining operations are being undertaken at two mineral lakes 10 miles south of Okanogan, Okanogan County, by C. A. Kearney of Omak. The chemical will be purified and dried and trucked to Okanogan for rail shipment to Coast paper mills.

Exploratory drilling on Spokane Indian Reservation holdings of *Big Smoke Uranium, Inc.*, recently were stepped up to two shifts, with the first starting at 4 a.m. A percussion drill is being used and results have been favorable. William O. Kumbera, Spokane, is company president.

John J. Stalick, Spokane, and Ernest Laukka, Chewelah, have taken leases and purchase options on the old *Loon Lake* copper and *Spokane Copper* or *Bluebird Copper* mines near Valley, Stevens County, Washington. They have been using a small bulldozer to open old portals. If results of their investigations warrant, a 500-foot shaft may be unwatered and a flotation plant installed. Last production was in 1918.

A search for commercial deposits of radioactive black sands containing rare earth elements is being carried on in northeastern Washington by the industrial research division of the Washington State College Institute of Technology. First work is being done in the Republic area of Ferry County. E. N. Klemgard and R. S. Crosby are in charge of the project.

A uranium soils analysis laboratory has been opened in Spokane, Washington by *Mine Consultants, Inc.* The firm is using the uranium geochemical technique recently perfected in the Denver laboratory of the United States Geological Survey. Donald D. Johns is chief chemist. Soil sampling programs are under direction of Fred O. Jones, consulting geologist and company vice president.

A geochemical investigation of the Mount Spokane uranium district is being made by the U.S. Atomic Energy Commission. A two-man crew from the agency's Denver, Colorado geophysical division started work at the *Daybreak* mine. A seismic crew from the Denver office is seeking to define geological structures deep beneath the surface.

"Differential is my kind of car"

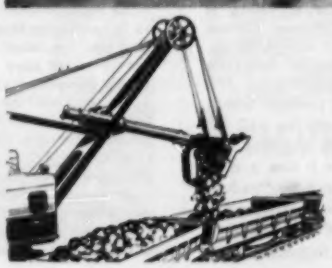
"I like the way they stand up under the punishment of that bruiser of a shovel. Unusually rugged construction does it. Somehow they seldom turn up for roll call at the shop. And out at the stockpile or dump they come clean. That 50° dumping angle is the answer. Dumping to either side is important, too."

This kind of talk from an increasing number of users is convincing. For nearly 40 years Differential Haulage Equipment has been doing a pace-setting job.

If you would like facts and figures to meet your needs, just write or call our Findlay office. You'll get prompt, expert help with your haulage problems, large or small.

DIFFERENTIAL PRODUCTS INCLUDE:

Air Dump Cars, Charging Box Cars, Ingot Mold Cars; Locomotives, Mine Cars, Mine Supply Cars, Rock Larries, Mantrip Cars, Dumping Devices and Complete Haulage Systems.



D

DIFFERENTIAL

STEEL CAR COMPANY

FINDLAY, OHIO

SINCE 1915—PIONEERS IN HAULAGE EQUIPMENT

Interior Dept. Has Forms For Claim Determination

The Department of the Interior's Bureau of Land Management has proposed a series of rules, regulations, and forms governing administration of Public Law 167 which amended the mining laws of the United States. (See details in the July 1956 issue of MINING WORLD, pages 61, 62, and 63.)

Details covered include: purpose and authority, common (mineral) varieties defined, restrictions on use of unpatented mining claims; request for publication of notice to mining claimant; evidence necessary to support a request for publication; publication of notice; service of copies; failure to comply; proof of publication; failure of claimant to file verified statement; hearing; time and place; stipulation between parties; hearing procedures; effect of decision affirming a mining claimants rights; recording by mining claimant of request for copy of notice; waiver of rights by mining claimant; and limitation of existing rights; exclusion of reservations in patents.

Full details and copies of forms may be secured from the Department of Interior, Washington 25, D. C.

Experts Plan Meeting On Energy Resources

The future of nuclear energy will be one of the major topics for consideration at the first annual Energy Resources Conference to be held in Denver, Colorado October 29 through 31.

Other sources of energy, including coal, gas, petroleum, oil shale, and solar energy, will be discussed by an outstanding group of speakers and panelists, according to program chairman Dr. Fred W. Brown, director of the United States Bureau of Standards Laboratory at Boulder, Colorado.

The third day of the meeting will be devoted to field trips to scientific and research centers in the Denver area. Reservations for the convention may be made with the Energy Resources Conference, c/o Denver Chamber of Commerce, 1301 Welton Street, Denver 4, Colorado.

Camp Bird Mines Ltd. has not renewed the lease on *Camp Bird* mine at Ouray, Colorado held by *King Lease, Inc.* Camp Bird, an English company, will operate the mine itself with Keith Johnson as resident superintendent, C. V. Norman, manager consultant, and C. P. Tremlett, engineer in charge.

British Western American Uranium Corporation has purchased the *Greater Minerals Corporation* which owns a 150-ton-per-day ball mill at Georgetown in Clear Creek County, Colorado, and has been profitably operating the *Grizzly* mine near Silver Plume for some time. The purchase of 100 percent of Greater Minerals stock involved a consideration of $400,000 payable in cash and net smelter returns. The company plans an extensive development program for the Grizzly mine and a stepped-up milling operation to a maximum of 150 tons. Reserves are estimated at 58,930 tons of blocked out ore and 17,000 tons of probable ore carrying values in lead, silver, and gold. Greater Minerals will operate as a wholly owned subsidiary of British Western.

Three companies are carrying on uranium development work in the Marshall Pass area of Gunnison County, Colorado. *Vulcan Silver Lead*, a subsidiary of *Callahan Zinc-Lead Company, Inc.*, is working between Marshall and Monarch passes. A small amount of surface ore has been shipped, but the current program is drilling. Adjoining the Vulcan property are the claims of *Monarch Exploration*. This firm is also drilling. The third major operation is that of *Uncompahgre Exploration* which is a partnership of Jack and Paul Brinkerhoff. This firm has shipped 18 tons of uranium ore which averaged 1.06 percent uranium oxide and 0.06 vanadium.

Anschutz Drilling Company of Denver and *Little Star Uranium Company* of Casper, Wyoming have merged through an exchange of stock. Surviving company is Anschutz Drilling headed by Fred Anschutz.

Heimdal Mining Corporation has been incorporated at Tioga, North Dakota to explore for ores, minerals, and fissionable materials. Directors include Anders Heimdal, Alvin Foss, and Arnold Ives, all of Tioga.

Pioneer Carissa Gold Mill To Be Converted for U_3O_8 Processing

A third uranium mill for Fremont County in central Wyoming is foreseen with the purchase for $1,000,000 of the Pioneer Carissa cyanide gold mill near South Pass City, famed gold mining camp. The mill was purchased by Rocket Mining Corporation of Salt Lake City from Pioneer Carissa Gold Mines Inc., also of Salt Lake. The mill will be placed in operation as soon as possible, perhaps within six months, and negotiations already have started with the AEC for a milling contract. According to R. G. Olli, president, the firm will start milling already consigned uranium ore whether it has a contract or not, operating on a base price of $8 per pound for "yellow cake." The processed ore would be sold on the basis of a separate contract for each truck load. The Gallgher Company of Salt Lake City is nearing completion of a detailed engineering study that will determine requirements for conversion from a cyanide gold processing mill to a carbonate leach uranium mill. Water supply and tailing disposal facilities are ideal. Initial capacity will be 200 tons per day, with provision for easy enlargement in the future. The former owners recently completed extensive modernization of the mill, and more than 90 percent will be usable in the conversion. Located about 55 miles from the AEC buyingstation at Riverton, and about a mile from a paved highway, the mill will serve independent uranium producers. Lost Creek Oil & Uranium Corporation of Rawlins, was recently awarded a contract by AEC for construction and operation of a mill near Crooks Gap in Fremont County. Lucky Mc Uranium Corporation and Utah Construction Company are expected to be awarded a contract shortly for construction and operation of a mill in the Gas Hills area, also in Fremont County.

SOUTH DAKOTA

The state of South Dakota has received its first royalty payment for uranium mined on its public land. A check for $87.15 was mailed to the School and Public Lands Department by Mike C. Kennedy of Edgemont. Mr. Kennedy's property is on common land two miles south of Edgemont. The royalty is 10 percent of the base price of the ore, excluding development, hauling, and initial production allowances.

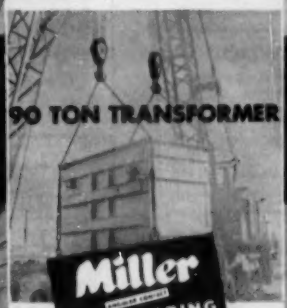
The South Dakota Revenue Commission reports that *Homestake Mining Company* of Lead, South Dakota, paid $201,731 in state ore taxes for the second quarter of this year for 411,242 tons of ore, valued at $5,108,090. In the same quarter of 1955, Homestake production was 387,091 tons, valued at $4,563,947. Tax on this was $181,261.

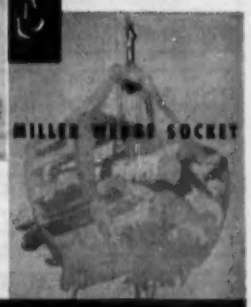
UTAH

The *Uranium Reduction Company's* new $8,000,000 ore processing mill near Moab, Utah should be started up some time this month. *American Zinc, Lead and Smelting Company* will manage the

FINEST PRECISION SWIVELS IN THE WORLD

→ There are many practical, diversified uses for Miller Swivels, in capacities from 700 lbs. to 250 ton. 16 different styles in stock . . . special adaptations designed on request.





Miller BALL BEARING SWIVELS Products

GENERAL MACHINE & WELDING WORKS inc
1100 East Second St. Pomona, Calif
P.O. BOX 938 DEPT. MW

WRITE NOW FOR COMPLETE CATALOG

GRIPHOIST
TIRFOR

"I'll do your pulling and lifting"

WEIGHS 42 LBS.
PORTABLE
MANUALLY OPERATED CABLE HOIST
UNLIMITED CABLE TRAVEL
East of Mississippi River
PRINCETON GRIPHOIST INC.
32 George St., Boston 19, Mass.
Hiland 5-9493

West of Mississippi River
GRIPHOIST, INC.
424 Byrant Street
San Francisco 7, California
EXbrook 2-6280

Lifts, pulls or lowers 6 tons or more when rigged with tackle blocks.

3300 LBS.

CHANGE OF ADDRESS

CIRCULATION DEPARTMENT
MINING WORLD with which is combined the Mining Journal
121 Second St., San Francisco 5, Calif.

Please change the address of my Mining World subscription

NAME .....
OLD ADDRESS .....
NEW TITLE OF POSITION .....
NEW ADDRESS .....
NEW COMPANY CONNECTION .....

WEIGHTOMETER

Use the WEIGHTOMETER for accurate, dependable tonnage controls in mills and concentrators. Since 1908 WEIGHTOMETERS have helped many mines and mills to obtain efficient operation. Automatically records and totalizes without interrupting flow.

Easily installed, simple, fully enclosed, durable.

MERRICK SCALE MFG. CO.
180 Autumn Street
PASSAIC NEW JERSEY

PROFESSIONAL DIRECTORY

One-Inch Card, $80 Yearly—½-Inch, $35 Yearly, Payable in Advance.

CONSULTING ENGINEERS:

CHAPMAN AND WOOD
Consulting Mining Engineers and Geologists
506 Jefferson St., NE Albuquerque, N. M.
Uranium Assays • Radiometric and Chemical
Vanadium • Thorium
Mine Examination and Evaluation
Exploration and Development Management
P.O. Box 8362 Phone: 6-1675

COWIN & CO., INC.
Mining Engineers and Contractors • Consulting Appraisal Reports • Shaft & Slope Sinking • Mine Development • Mine Plant Construction.
1-18th Street, S. W. Birmingham, Ala.
Phone 56-5566

NORTON K. EARLE
Consulting Land Surveyor
U. S. Mineral Surveyor
11161/2 N. Western Ave., L. A. 29, Calif.

GUY E. INGERSOLL
Registered Professional Engineer in Texas, Arizona and New Mexico
Mine Examinations and Geological Reports
5505 Timberwolf Drive El Paso, Texas

HERBERT BANKS JOHNSON
CONSULTANT
Electrostatic Separation
Process Developments
804 Franklin Street Clearwater, Florida

PHILIP L. JONES
Consultant
Mineral Economics & Mineral Dressing
Heavy Media Specialist
405 Miners Bank Bldg. Tel. MAyfair 3-7161
Joplin, Mo.

C. P. KEEGEL
Mining & Metallurgical Engineer
Administration Appraisal
1721 So. Fourteenth St. Tel. DUdley 4-6981
Las Vegas, Nevada

MAC AFEE and COMPANY
Consulting Engineers
MINE EXAMINATION & MILL DESIGN
Exploration • Construction
Operation & Management
CHEMICAL & METALLURGICAL LABORATORY
FOR EXACT QUANTITATIVE FLOWSHEET DATA
3165 Wilshire Boulevard • Los Angeles 5
DUnkirk 8-9474 • CABLE MACAFEE

MURPHY, F. M.
Consulting Mining Geologist
1201 Maryland Parkway, Las Vegas, Nev.
Dudley 4-5235

RODGERS PEALE
Consulting Mining Geologist
315 Montgomery St. San Francisco 4, Calif.

STILL & STILL
Consulting Mining Engineers and Geologists
Room 24 Union Block Prescott, Arizona

WISSER AND COX
Consulting Geologists
88 New Montgomery St.
San Francisco, California

GEOLOGICAL & GEOPHYSICAL SURVEYS
Exploration Programs & Property Evaluations
Magnetic, Gravity, Electrical & Radioactivity Surveys for Mineral Deposits & Petroleum
CLYDE H. WILSON
Geologist—Geophysical Engineer
WILSON EXPLORATION COMPANY
366 So. Fifth East, Salt Lake City 2, Utah

HARRY J. WOLF
Mining and Consulting Engineer
Examinations—Valuations—Management
One Park Place, New York 7, N. Y.
Cable: MINEWOLF Tel.: REctor 2-5307

CHEMISTS, SAMPLERS, SHIPPERS' REP'S:

ARIZ. TESTING LABORATORIES
CLAUDE E. McLEAN, REGISTERED ASSAYER
Analytical and Consulting Chemists
Box 1888 817 W. Madison St. Phoenix

B. W. DEASON V. E. WORSLEY
BLACK & DEASON
Assayers and Chemists
Ore Shippers Represented at all Smelters
P. O. Box #1888 Salt Lake City, Utah

THE COLORADO ASSAYING CO.
ASSAYERS, CHEMISTS and SPECTROGRAPHERS
Est. 1900
Gold and Silver $2, Copper $1, Uranium $7.50. Send for free copy of our Mineralogist Pocket Reference Giving Detailed Information on all Principal Ores.
2013 WELTON ST., DENVER 1, COLORADO

T. G. Deggendorfer
Shippers' Representative
Control Assays
Box 840 Kellogg, Idaho

DICKINSON LABORATORIES
Assayers—Chemists—Metallurgists—Umpires
Shippers Representatives at Local Smelters
Representatives at Mexican Border
Points for Shippers of Manganese and Fluorspar
1300 West Main Street El Paso, Texas

LEDOUX & COMPANY
Established 1880
Chemists—Spectroscopists—Assayers
Consultation & Research
Mine Examination & Analyses
Shippers Representatives at Seaports and Refineries throughout the U. S.
359 Alfred Avenue, Teaneck, New Jersey

GOODALL BROTHERS
ASSAYERS AND CHEMISTS
SHIPPERS' REPRESENTATIVES
Helena Established 1909 Montana

HANKS, INC., ABBOT A.
ASSAYERS AND CHEMISTS
Supervision of Sampling at Smelters
Spectrographic Analysis
624 Sacramento St. San Francisco 11

HAWLEY & HAWLEY
W. E. HAWLEY, Mgr.
Assayers, Chemists
Shippers' Representative
P. O. Box 1060 Douglas, Arizona

• SPECTROGRAPHIC ANALYSES
• EVALUATION • RESEARCH
ORE RESEARCH AND LABORATORIES, Inc.
WRITE FOR BROCHURE DEPT. C
1511 LEVEE STREET DALLAS 7, TEXAS

SMITH-EMERY COMPANY
Established 1910
Assayers—Chemists
Metallurgists
Spectrographers
Shippers' Representatives
Price List on Request
781 East Washington Blvd., Los Angeles, Calif.

Wood Assaying Co., Henry E.
Established 1878
ASSAYERS and CHEMISTS
733 W. Colfax Denver 4, Colorado

DRILLING COMPANIES:

MOAB DRILLING COMPANY
Diamond Core Drilling Contractors
"Uranium Exploration is our Business"
Charles A. Steen, President
Albert Hibacek, Jr., General Manager
52 E. Central Street Box 387
Phone 4181 Moab, Utah

B. H. MOTT & SONS, INC.
Diamond Core Drilling Contractors
Air Rotary Shot Drilling
Huntington, W. Va. Birmingham, Ala.
Mfg's Core Drills & Accessories
Grand Junction, Colo.

NEW YORK-ARIZONA DEVELOPMENT CORP.
Diamond Core Drilling
614 Mayer-Heard Building Box 347
Phoenix-Arizona Globe, Arizona
Phone Alpine 2-8614

plant.

Two Wallace, Idaho, firms—*Uranium Mines, Inc.* and *Uranium Discovery & Development Company*—have purchased a 20 percent gross royalty on proceeds from 158 of 160 claims making up the *Ransom Brothers'* mine near Blanding, Utah. A similar royalty on the other two claims is owned by *Uranium D & D, Sunshine, Silver Syndicate, Sunshine Consolidated,* and *Clayton Silver Mining* companies, all of Idaho. Shipments are being made from both groups of claims.

Continental Uranium, Inc. reports that it reached the ore body in the southeast end of the Rattlesnake pit and mined about 500 tons in July. Production is expected to reach a rate of 3,000 to 4,000 tons per month shortly. The Far North ore body, an underground mine on the Rattlesnake property, is now producing at at rate of 400 tons per month. The firm has installed a new Northwest ¾ yard shovel, a new Michigan one-yard loader, new trucks, and drills. With this equipment, the company expects to maintain a very favorable cost ration. Stripping will continue, and, as the pit progresses, mining of adjacent underground pods of ore already known to exist from previous drilling will be mined.

The recent slide from the "S" to "O" levels in the Bingham Canyon open pit copper mine of *Kennecott Copper Corporation's Utah Corporation,* in which one man was killed, has not affected ore removal or rate of production. The slide area was in the overburden portion of the mine. An unpredictable fault movement was said to be the cause of the accident.

WYOMING

Lost Creek Oil & Uranium Corporation of Rawlins, Wyoming has started construction of its uranium mill and townsite in the Crooks Gap area. Foundations for the mill and for some 20 two-bedroom homes have already been poured. An adequate water supply has been established and power lines have been run in from nearby Crooks Gap oil field. The firm hopes to have its sampling plant and scales in operation later this month. The mill should be in operation by next summer. The AEC has announced that it will purchase some 100,000 tons of ore, starting as soon as the sampling plant is in operation, for stockpiling at the mill site. The firm will purchase another 50,000 tons of ore at the mill prior to its opening. The mill will process ore owned by the company, and also that consigned by other producers in the Gas Hills and Crooks Gap areas. The acid-RIP process will be used.

The comparative low cost of open-pit mining in the Gas Hills section of central Wyoming was evident in the recent report by *Aljob Mining Company* that its dirt-moving contractor had removed overburden and mined 8,000 tons of ore for $10,000. Assays indicated value of the ore at approximately $200,000.

Amrad Oil & Minerals Corporation of Salt Lake City, Utah is conducting an extensive drilling program on 199 uranium claims it purchased in the Gas Hills area from Lander residents. Two drilling rigs are presently working.

FOR SALE, Equipment at Rosario Mine, Tegucigalpa, Honduras.

1—Compressor, Chicago Pneumatic 600 Duplex Single Stage, 18" Dia. x 12" Stroke 2230 cu. ft. at 40 lbs. pressure, 300 RPM. Complete with shaft mounted, direct drive 200 HP Synch. motor, exciter and control. 3 Phase 60 cycle, 440 volt $6500.00

1—I-R Compressor, Type XB duplex, single stage 13" x 12" stroke 880 cu. ft. 40 lbs. pressure, 75 HP motor, V-Belt drive, with controls $3000.00

1—Platform Howe Truck Scale, 20,000 Lb., 10' long $ 900.00

2—Crushers, Allis Chalmers, Gyratory, #4 Gates, Style "K", 32" x 12" Pulley one RH, one LH, 25 HP G.E. motor —each $1500.00

1—Ball Mill, Allis Chalmers, 5' x 9' spur gearing, Scoop feeder complete with Jack shaft and 75 HP G.E. motor and controls $3000.00

3—Ball Mills, Allis Chalmers, 5' x 9' Herringbone Gearing, complete with pinion Shaft and 75 HP motor and controls —each $3500.00

1—Dorr Classifier, DSFXH, 5' x 25'-6" Steel Tray $4000.00

3—Dorr Classifiers, 1—DSF, 1—DSD, 1—DSC, 6' x 18", Steel Tray —each $2000.00

1—Jig—Denver Duplex Mineral, 16" x 24", with motor and control $1000.00

2—Filter Presses, Merrill, Center washing slime, 90 frames ea. 4'x6'x3" —each $10,000.00

4—Filter Presses, Merrill, Type "C"—Precipitate Filter, 20 frames, Triangular, 36" x 3" —each $1000.00

1—Trolley Locomotive, G.E., 8 ton, with extra motor $4500.00

1—Trolley Locomotive, G. E. 7 ton, with extra motor $3500.00

All of the above prices are F A S at the port, Amapala, Honduras, C.A. Also various dia-phragm, centrifugal and Triplex pumps used in milling operation, at bargain prices. We have spare parts for all of the above equipment which we will sell at 50% of cost.

Contract H. G. Carlson by Radio Telephone, Cable or Air Mail, Tegucigalpa, Honduras.

EQUIPMENT LOCATED
GA.—N.Y.—CALIF.—OHIO—TEXAS—ILL.

GRINDING MILLS

BALL MILLS—3'x4', 4'x8', 5'x6', 5'x8', 5'x10', 6'x5', 6'x7', 6'x8', 6'x10', 9'6"x11'.
HARDINGE MILLS—4'6"x16", 6'x14", 6'x22", 6'x36", 7'x22", 8'x36", 8'x48", 10'x48".
ROD MILLS—12"x24" LAB., 3'x10', 4'x8', 4'x9', 4'x14', 5'x8', 5'x10', 5'x14', 6'6"x14', 8'6"x12'.
TUBE MILLS—5'x14', 5'x22', 5'6"x22', 6'6"x21'.

FILTERS—SEPARATORS—CLASSIFIERS

OLIVER DRUM—6'x10', 12'x14', 14'x18', 11'6"x 18'.
DORR RAKE CLASSIFIERS—5'x25', 8'x38', 12'x 31', 14'x30'.
DORR BOWL RAKE—3'x24'x12', 5'x30'x26', 16'x 24'x28'.
WOODS SAND CLASSIFIER—72", 96".
CONVEYCO SAND CLASSIFIER—4'x10'.
17 THICKNERS—100', 80', 36', 24', 16' & 12'.
20"x15 EAGLE SINGLE SCREW COARSE MATERIAL WASHER.

ROTARY DRYERS & KILNS

DRYERS—40"x21', 4'x30', 6'x40', 6'x60', 8'x 125'.
KILNS—6'x28', 6'x7'x80', 7'x110', 9'x140', 10'x105'.

JAW CRUSHERS

BLAKE TYPE—66"x84", 36"x48", 30"x36", 24"x36", 18"x36", 16"x32".
SINGLE SHAFT—25"x40", 20"x30", 18"x26", 10"x24".
CAM & ROLLER—24"x40", 14"x26", 11"x36", 10"x20", 6"x20".

GYRATORY FINE REDUCTION CRUSHERS

SYMONS—3', 4', 5½'.
KENNEDY—198, 258, 378.
SUP. MC C.—6", 10", 18" A-C 322B.

GYRATORY PRIMARY CRUSHERS

6", 10", 14", 16", 20" & 36" SUP. McC.—GATES AL. CHAL. 3, 4, 5, 6, 7½, 8, 9, 12K.

CONVEYORS

30" x 140', 30" x 160' & 30" x 200'.

NEW 42 IN. CONVEYOR BELT

240', 8-PLY, ¾" TOP, 1/32" BOTTOM.
113', 6-PLY, 3/16" TOP, 1/16" BOTTOM.

DIESEL LOCOMOTIVES

25 TON AND 44 TON GEN ELEC DIESEL ELEC.
10 TON WHITCOMB MINE DIESEL.

AIR COMPRESSORS

3000 FCM SULLIVAN 500 HP, 2300 VOLTS.
2—2750 CFM Myer RAND, 475 HP, 2200 VOLTS.

MINE CARS

150 KOPPLE 1 & 1½ YD., 24 GA. V-SHAPE.

MINE LOCOMOTIVES

18 MANCHA 1½, 3, 5, 8, & 10 TON BATTERY.

MINE LOADERS

7 EIMCO 105, 21, 12 B, 40.

DARIEN, 60 E. 42nd St., N.Y. 17, N.Y.

RAY DRILLING COMPANY, INC.
Mineral Exploration Contractors

343 South State — Telephone:
Salt Lake City — Elgin 5-9345
Riverton, Wyoming — Green River, Utah

For Sale or Lease: Oregon deposits of Bentonite, Perlite, Soda and Nitrate. Large deposit containing Zirconium, Titanium, and twelve other elements. Going business mining and processing Diatomite, large deposit.

Archie M. Matlock
1321 West 11th Avenue • Eugene, Oregon

Thickener: 28x10 Dorr; steel tank; low-head
Ball Mill: 6x7 Hendy; motor 125 hp 440-v
Ball Mill: 5x4 Straub; motor 50 hp 440-v
Ball Mill: 5x5 Allis-Ch., 60 hp 440-v

Paul F. Smith
39 W. Adams St. — Phoenix, Arizona

DIAMOND DRILL
Contracting Company
S. 18 Stone, Spokane 31, Wash.

- "SUPER PIONEER" hand portable core drills
- "K & S INTERNATIONAL" standard surface drills
- "DIA-HARD" Core Barrels
- And a complete line of "Super Pioneer" and standard diamond drilling accessories.

ALLISON STEEL MANUFACTURING COMPANY

Mine and Mill Buildings • Mine Rails • Ore Cars • Steel Gallows Frames • Ball Mills • Muck Plates • Crucible Drill Steel

We offer a complete repair service to the Mining Industry. Our new Machine Shop is equipped to handle your work quickly and economically.

Hot Milling of All Types of Detachable Bits

SOUTH 19TH AVENUE
PHOENIX — ARIZONA
PHONE ALpine 8-7731

FEDERAL PIPE & TANK CO.

—WOOD PIPE and WOOD TANKS—

Factory and Main Office
6851 E. Marginal Way
Seattle 8, Wash.

BUSINESS MEN'S CLEARING HOUSE

601 MIDLAND SAVINGS BUILDING
DENVER, COLORADO

52 years of world-wide placement service for all classes of executive, engineering, operating, etc., mine and mill men

FILE YOUR APPLICATION WITH US

Porto Vacuum Drill

USES NO WATER

Famous McCulloch Engines
Drills to 150 Feet
Without Circulation Loss.

See Cuttings deposited in Glass Jar or Drills 1¾" Hole and Takes ⅞" Core

9¾ H.P. and 1½ H.P. Models.
Fast Water Pump Conversion.
Also Built-in Water Pump Drills.
6 H.P. - 44¼ lbs. 9 H.P. - 51 lbs.

PORTO TOOL CO.
Affiliated with Uranium Enterprises
3103 Santa Monica Blvd.
Santa Monica, Calif.
Telephone EXbrook 4-5903 - 4-5904

YOUR BEST SOURCE

MINING—MILLING MACHINERY

Classifiers
1—60" x 21' Akins Spiral
1—45" x 17'3" Akins Spiral
2—6' x 25' Dorr Duplex Rake

Crushers
3—9 x 36 Cedar Rapids
1—10 x 21 Telsmith Roller Bearing

Feeders
1—54" x 16' Stephens-Adamson Heavy Duty, Apron Type
2—36" x 72" Jeffrey Traylor, Grizzley Pan, Vibrating Type

Flotation Machines
1—#250 Denver Unit Cell
32—Fagergren 56" x 56", Model H5
1—8-cell Galigher Agitair, 48" x 48"
1—4-cell #24 Denver Sub A
1—6-cell #24 Denver Sub A
1—8-cell 18Sp. Denver Sub A

Jigs
2—42" x 42" Pan American Duplex
1—12" x 18" Denver Duplex
1—8" x 12" Denver Simplex
1—24" x 36" Denver Duplex

Filters
1—8½' 6-leaf Eimco, Rebuilt
1—6' 6-leaf Oliver, Disc
1—6' 5-leaf Oliver, Disc
1—6' 2-leaf American, Disc
1—4' 4-leaf Oliver, Disc
1—5' x 4'8" Oliver drum
1—3' x 4' Oliver Drum

Mills, Ball
1—8' x 6' Marcy Ball
1—6' x 8' Allis-Chalmers
3—8' x 48" Hardinge Conical
1—8' x 36" Hardinge Conical
1—5' x 5' Allis-Chalmers, New liners and gears

Hoists
4—75 HP Vulcan Single Drum
3—150 HP Vulcan Single Drum
1—400 HP Vulcan Single Drum
1—75 HP Vulcan Double Drum
1—450 HP Ottumwa New, Double Drum

Loader-Mucking Machine
1—Eimco 105' overshot loader with 1½ yd. Bucket, 1954 Model
1—Eimco 12B, 18" Ga.
3—Gardner Denver, GD9, 18" Ga.

Locomotives
1—Universal Tramaire, Air, 18 Ga.
1—2½ T G.E. Battery, 18" Ga.
1—2½ T Whitcomb, Battery, 24" Ga.
1—10 T Plymouth Diesel, Std. Ga.

LARGE STOCK—WRITE, PHONE, WIRE

MACHINERY CENTER, INC.

P. O. BOX 964 • PHONE—HU-47601 • SALT LAKE CITY, UTAH

POSITIONS OPEN

MINE SUPT., fgn.	equivalent $675
MINE SUPT., E. M. 10 yr. exp.	$775-$825
SUPT. construction read. engr. fgn.	$1,000
ADMINISTRATIVE asst. E. M.	to $700
MINE SURVEYORS, Colo.	$455
MINE engr., plant design, perm.	OPEN
MINE ENGR., fgn.	start Bd. Rm. & $425
JR. MINE engrs. Fgn. & U. S.	$400-$450
DIAM. drill f'man. fgn. 3 yr. cont.	$550
MILL SUPT., dif. Sat. Idaho	OPEN
GEOLOGIST field. mining hgrs. Denver	to $700
GEOLOGIST mine explor. Mexico. Spk. Span.	$600
JR. MET. engrs. (2) S. W.	$425-$468
METAL'GIST research metals	to $800
METAL'GIST, exp. iron ore	to $650
METAL'GIST or Ch. E. corrosion	OPEN
METAL'GISTS, chemists, Ch. Es. res'ch.	to $800
ASST. metal'gist or chemist, S. W.	to $525
METAL'GIST physical tests, Colo.	$525
METAL'GISTS (3) uranium	$500 up
SALES engr. Dvr. E. Met.	OPEN
CHEM. ENGR. pilot plant exp. S.W.	$700 up
CHEM. ENGR. chem. plant exp. S.W.	OPEN
MET. & CHEM. engr. grads.	$375-$450
DESIGNER, drafts, mine, fgn.	$600-$650
DESIGNERS, elect. mech. Denver	to $650
MILL design checker, Denver	$475
METALLURGIST or chem. engr. S.W.	$440
JR. METAL'GIST, 1-2 yrs. exp.	$400
MET. or chem. engrs. grads.	start $360
ENGRS. met., chem., mech.,	$378-$700
MECH. project engr. const. perm.	$630
INDUST'L engr. 5 yr. exp. fgn.	$750
INDUST. engr. large mill	OPEN
ASST. plant engr. large mill	to $550
MASTER mech. 35-45, mine, fgn. no fee	$650
MASTER mech. mine-mill, U.S.	$650
CHF. CHEMIST, metals. Pa.	$600-$750
CHEMISTS, assayers	$400-$500
MINE electrician, Idaho	OPEN
CHIEF ACCT. mine, mill, Ariz.	to $700
BUDGET engr. M.B.A., mine, spic.	to $700

GLENN B. WILSON

EMPLOYMENT SPECIALISTS

306-310 BOSTON BLDG., 828-17th St.

DENVER 2, COLORADO

SURPLUS EQUIPMENT FOR SALE

In order to balance our equipment inventory, we are disposing of over 150 units including:

SHOVELS (1½ to 5 yd.) • DRAGLINES • COMPRESSORS • BULLDOZERS
LOADERS • TRUCKS • CONCRETE & PAVING EQUIPMENT
ROAD BUILDING, EARTHMOVING, SCREENING EQUIPMENT ETC.

Located in Phoenix, Arizona and Fairplay, Colorado. Many items purchased new for the Montgomery job completed in September.

NO JUNK—All equipment was purchased for our own use and operated and maintained by our skilled personnel. Many units actually in like new condition.

CALL, WIRE OR WRITE FOR A COMPLETE DESCRIPTIVE LIST

FISHER CONTRACTING CO.

Attn: Jack E. Brown, Surplus Equipment Sales
P. O. Box 6306 PHOENIX, ARIZONA Phone Alpine 8-7741

NOTE:
We will maintain a temporary sales office in the Fairplay Hotel at Fairplay, Colorado until approximately October 1st. Please DIRECT ALL INQUIRIES TO:

Fisher Contracting Co. Attn: Jack E. Brown
P. O. Box 177 Fairplay, Colorado Phone Fairplay 21

FAST, ECONOMICAL SERVICE ON DEPENDABLE RECONDITIONED MACHINERY SINCE 1898.

CLASSIFIERS

1—27" x 14'8" Denver Simplex Rake Classifier
1—36" x 18'4" Dorr Simplex Rake Classifier
1—45" x 17'3" Akins Spiral Simplex Classifier

CORE DRILL

1—Longyear Portable Core Drill, Gas Engine Driven

LABORATORY EQUIPMENT

5—2¼" x 3½" New Morse Lab Jaw Crushers
3—4" x 6" New Morse Lab Jaw Crushers
1—Gates #00 Lab Gyratory Crusher
1—McCully #1 Lab Gyratory Crusher
2—Stearns-Roger Lab Batch Ball Mills
1—8" x 60" New Morse Lab Classifier
2—500 Gram Denver Lab Flotation Cells
1—1000 Gram Morse Lab Flotation Cells
4—2000 Gram Denver Lab Flotation Cells
2—Stearns-Roger Lab Pressure Filter
1—18" x 27" Revolving Lab Dryer
1—10" Lab Pug Mill

VENT PIPE

1538'—16" Steel Pipe. 14 Ga.
1348'—18" Steel Pipe. 12 Ga.
3200'—20" Steel Pipe. 16 Ga.

SCREENS

1—18" x 56" Traylor Vibrating Screen
1—3' x 4' Allis-Chalmers Aero-Vibe Screen
1—34" x 12' Symons Single Deck Screen
1—3' x 8' Simplicity 3 deck Screen
1—4' x 12' Tyler 2 deck Screen

BLOWERS AND FANS

2—Roots #1 Rotary Blowers
1—Sutorbilt #3M Rotary Blower
1—9" x 15" Victor-Acme Rotary Blower
1—7" x 17" Victor-Acme Rotary Blower
1—Sutorbilt #7L Rotary Blower
1—Sutorbilt #12-30 Rotary Blower
1—16" x 48" Connersville #5 Rotary Blower
1—Coppus-Vano Blower. Type SM Size 250
1—Coppus-Ventair Blower. Type TM Size 6
1—Coppus-Vano Blower. Type SM. Size 300
7—12000 CFM American Blowers. Type HS
1—7' Jeffrey Aerovane Mine Fan
1—42" Jeffrey Aerodyne Mine Fan #811
1—10' Joy La-Del Mine Fan

FILTERS

2—4' x 2' Morse Drum Filters
1—3' x 4' Oliver Drum Filter
1—4' x 8' Eimco Drum Filter
1—6' x 8' Morse Drum Filter
1—4'—2 disc Denver Leaf Filter
1—6'—2 disc American Leaf Filter
1—6'—2 disc Oliver Leaf Filter
1—6'—5 disc Morse Leaf Filter
1—19" Marsa Filter Press
1—36" Sweetland #12 Filter Press

COMPRESSORS

1—42 CFM Ingersoll-Rand ME-1
1—44 CFM Ingersoll-Rand ER-1
1—50 CFM Quincy VC-2
2—88 CFM Ingersoll-Rand ER-1
1—120 CFM Ingersoll-Rand ER-1, 8" x 6"
1—161 CFM Chicago-Pneumatic PB-2
1—179 CFM Ingersoll-Rand ME-1
1—198 CFM Sullivan WL-60
1—293 CFM Ingersoll-Rand Type 10
1—364 CFM Sullivan WG-9
1—445 CFM Worthington M-80
1—447 CFM Ingersoll-Rand Type 10
1—637 CFM Sullivan W13
1—688 CFM Union Low Pressure
1—800 CFM Ingersoll-Rand Type 10
3—105 CFM Ingersoll-Rand Portable Gas Engine Driven, Rubber Tire Mounted
1—105 CFM Schramm Portable, Gas Engine Driven, Rubber Tire Mounted
1—105 CFM Ingersoll-Rand. Portable. Gas Engine Driven
1—105 CFM Worthington. Gas Engine Driven
1—210 CFM Worthington Portable. Gas Engine Driven
1—310 CFM Sullivan Portable. Gas Engine Driven

DRILL SHARPENERS & GRINDERS

1—Sullivan "Little Smithy" Class E
1—Ingersoll-Rand #24
1—Ingersoll-Rand #40
2—Ingersoll-Rand #50
1—Ingersoll-Rand JA4 Air Driven Bit Grinder
1—Ingersoll-Rand JG-3 Bit Grinder, Gas Engine Driven
1—Ingersoll-Rand J-3 Bit Grinder. 3 HP Motor
2—Massco Bit Grinders. Type 6. 5 HP Motors

BALL MILLS

1—4' x 4' Marcy Ball Mill
1—4' x 4' Denver Ball Mill
1—6' x 48" Hardinge Conical Ball Mill
1—8' x 22" Hardinge Conical Pebble Mill
1—3' x 8' Marcy Rod Mill

TUGGER AND SLUSHER HOISTS

3—Ingersoll-Rand Model Air Tuggers
1—Ingersoll-Rand Model EU Air Tugger
1—Sullivan Model L-111 Air Tugger
2—Joy Model F-113 Air Tuggers
5—Gardner-Denver Model HH Air Tuggers
1—Gardner-Denver Model HM Air Tugger
2—5 HP Sullivan Electric Tuggers
1—5 HP Sullivan Electric 2 drum Slusher
2—15 HP Joy Electric 2 drum Slushers
1—10 HP Sullivan Electric 3 drum Slusher
1—10 HP Sullivan 2 drum Slusher. Gas Engine Driven

MORSE BROS. MACHINERY COMPANY

2900 Brighton Blvd. **Denver 1, Colorado**

"The Origin and Nature of Ore Deposits"
By The Walker Associates
Box 1068, Colorado Springs, Colorado

Price: $6.50 postpaid in the United States
$6.75 postpaid in Canada and Mexico
$7.00 postpaid in other countries
Mailed on approval.

FOR SALE

SMALL CHROME MILL
COMPLETE WITH ALL NECESSARY PARTS

Pipe—Belts—Pulleys—Engines—8x8 Crusher

Sanella, 200 4th., Petaluma, Calif.

CLASSIFIED SECTION

8 pt. type 15c per word. 10 pt. type 20c per word. Minimum charge $5.00.

(For Box numbers addressed to Mining World, add $1.00)

Boxed ads (display) in either Market Place or Classified Sections—$8.50 per column inch.

(See Market Place Section for lower contract rates).

Closing Date: If proof required, 1st of preceding month, otherwise 10th.

SCRAP TUNGSTEN CARBIDE ROCK BIT INSERTS

are regularly purchased by Macro Tungsten Refinery. For our quotation F.O.B. shipping point, write P.O. Drawer 440, Port Coquitlam, B.C., Canada.

Market Place Advertising

360 inches	$6.50
180 inches	$7.00
90 inches	$7.50
45 inches	$8.00
Less than 45 inches	$8.50

Contract rates based on local number of column inches used within one year.
30 column inches equal one page.
Closing date: 1st of month preceding publication.
(Used and reconditioned equipment, liquidations, property sales only)
For additional 10,000 WORLD MINING export distribution: Add 50%

PUMPS—PUMPS—PUMPS
SAND—TAILINGS—SLUDGE—SLURRY
ABRASIVE & CORROSIVE LIQUIDS
CAST IRON AND STAINLESS STEEL
FULL LINED AND PARTIALLY LINED
SIZE 2" to 14"—CALL OR WRITE

KROGH PUMP & EQUIPMENT CO., INC.
515 Harrison St.,
SAN FRANCISCO 5, CALIF.

INCORPORATE YOUR BUSINESS IN NEVADA

Do business anywhere. Non-liability of organizers and promoters. Charter issued quickly at low cost for any business except banking and public utilities. Over twenty five years of incorporation and finance experience. Details upon request. L. O. Goodman, Box 991, Globe, Arizona.

MINING PROPERTIES WANTED: Please submit complete details on acreage, location, development done, assays, engineer's report if available, and terms of purchase. Reply Box P-4, Mining World, 121 Second Street, San Francisco 5, California.

2 COPPER MINES 40 patented, 100,000 tons shipping blocked, million tons milling, pit, underground developed $1,000,000 cost. Power, gas, water. Ore royalty buys. Owner 4261 E. 1st, Los Angeles, California. An 25109.

INDEX OF ADVERTISERS IN MINING WORLD

** Asterisk indicates firms whose products are catalogued in* MINING WORLD's *1956 Catalog, Survey & Directory Number.*

*Acker Drill Co., Inc. 77
Agence Minière & Maritime, S/A 86
*Allis-Chalmers Mfg. Co., Const. Machy. Div. 40
Allis-Chalmers Mfg. Co., Industries Group .... WM 68 (World Mining Only)
*Allison Steel Mfg. Co. 105
*Alloy Steel & Metals Co. .. 85
*American Cyanamid Co. 42, 43
*American Manganese Steel Div. 6, 37
*American Smelting & Refining Co. 83
*American Zinc, Lead & Smelting Co. 79
Arizona Testing Laboratories 104
*Atlas Copco AB, Sweden WM 12, 13, 64 (World Mining Only)

*Baldwin-Lima-Hamilton Corp. 36
Black & Deason 104
*Boyles Bros. Drilling Co. .. 83
Brown, Inc., David 88
*Bunker Hill & Sullivan Mng. & Conc. Co. 79
Business Men's Clearing House 106

*C & D Batteries, Inc. 3
Callison, R. G. 105
*Carpco Mfg. Co. 30
Carter Oil Co. 100
Caterpillar Tractor Co. 1, 4, 25
Chapman & Wood 104
*Chilson Co. 91
*Clark Equipment International, C. A. ..... WM 22 (World Mining Only)
Colorado Assaying Co. 104
*Colorado Fuel & Iron Corp. 73
*Colorado Iron Works, Sub. of Mine & Smelter Supply Co. 86
*Columbia-Geneva Div., U. S. Steel Corp. 32
*Columbian Steel Tank Co. 83
Cowin & Co., Inc. 104
Cummins Diesel Export Corp. ..... WM 16, 17 (World Mining Only)

Darien Corp. 105
Deggendorfer, T. G. 104
*Dolster Concentrator Co., Inc. 88
*Denver Equipment Co. 44
*Detroit Diesel Div., Gen. Motors Corp. 34, 35
Diamond Drill Contracting Co. 105
Dickinson Laboratories ... 104
*Differential Steel Car Co. 101
*Dorr-Oliver, Inc. 41
*Dow Chemical Co. 38, 39
*duPont de Nemours & Co., Inc., E. I. 8

Earle, N. K. 104
*Eimco Corp. 9, 11, 13
*Electric Steel Foundry Co. 2
*Euclid Div., General Motors Corp. 75

*Euclid Div., General Motors Overseas Operations WM 54 (World Mining Only)

Federal Pipe & Tank Co. .. 106
Fisher Contracting Co. ... 106

*Galigher Co. 89
*Gardner-Denver Co. 84
General Electric Co., Locomotive Div. ..... WM 32 (World Mining Only)
General Machine & Welding Works, Inc. 103
General Mills, Inc. ... 18, 19
*General Motors Corp., Euclid Div. 75
*General Motors Overseas Operations ..... WM 14 (World Mining Only)
*General Motors Overseas Operations, Euclid Div. WM 54 (World Mining Only)
Goodall Brothers 104
*Goodyear Tire & Rubber Export Co. ..... WM 4 (World Mining Only)
*Greensburg Machine Co. .. 77
*Gripshoist, Inc. 103

Hanks, Inc., Abbot A. 104
Hawley & Hawley 104
Hawthorne, Inc., Herb J. WM 72 (World Mining Only)
*Hewitt-Robins, Inc. WM 20, 21 (World Mining Only)
Hough Co., Frank G. 76
Hughes Tool Co. ..... WM 1 (World Mining Only)

Ingersoll, Guy E. 104
International Harvester Export Co. ..... WM 23 (World Mining Only)
*International Smelting & Refining Co. 79

Johnson, Herbert B. 104
Johnson-March Corp. 72
Jones, Philip L. 104

Keegel, C. P. 104
Kaehring Overseas Co. WM 56 (World Mining Only)
Krogh Pump & Equipment Co. 107

Ladoux & Co. 104
*LeRoi Export Sales, LeTourneau-Westinghouse Co. ..... WM 63 (World Mining Only)
*LeTourneau-Westinghouse Co. 29, 31, 33
*Longyear Co., E. J. ..... 86, Inside Back Cover

MacAfee & Co. 104
Machinery Center, Inc. .. 106
*Mack Trucks, Inc. 12
Macro Tungsten Refinery .. 107
*Magma Copper Co. 79
Matlock, Archie M. 105
Meissner Engineers, Inc., John F. 86
*Merrick Scale Mfg. Co. .. 103
*Mine & Smelter Supply Co. 28, 78, 86
*Mine Safety Appliances Co. 15
Moab Drilling Co. 104
Morse Bros. Machinery Co. 107
Mott & Sons, Inc., B. H. 104
Murphy, F. M. 104

*National Malleable & Steel Castings Co. 68
New York-Arizona Development Corp. 104

O'Donnell & Schmidt 86
*Ore & Chemical Corp. 22
Ore Research & Laboratories, Inc. 104

*Pacific Foundry Co., Ltd. WM 74 (World Mining Only)
Peale, Rodgers 104
*Pittsburgh Lectromelt Furnace Corp. 14
Porte Tool Co. 106

Quaker Rubber Div., H. K. Porter Company, Inc. .. 66

Ray Drilling Co., Inc. 105
Resisto-Loy Co. 70
*Riblet Tramway Co. 88

Sanford Day Iron Works 20, 21
Schrader & Lockwood, Inc. 86
*Sheffield Steel Corp. .. WM 71 (World Mining Only)
*Simplex Wire & Cable Co. 23
Smierchanski, Mark G. 86
Smith-Emery Co. 104
Smith, Paul F. 105
*Stance Mfg. & Sales, Inc. 98
*Standard Oil Co. of Calif. 80
*Standard Steel Corp. 70
*Stearns Magnetic Products WM 73 (World Mining Only)
*Stearns Roger Mfg. Co. .. 96
Still & Still 104
*Syntron Co. 95

*Timken Roller Bearing Co. 26, 27
*Thor Power Tool Co. 82
*Traylor Eng. & Mfg. Co. .. 16

*U. S. Steel Corp., Columbia-Geneva Div. .. 32

*Vulcan Iron Works 74

*Wedge Wire Corp. 90
*Western Machinery Co. Inside Front Cover
*Western Precipitation Corp. 24
*Westinghouse Electric International Co. ..... WM 19 (World Mining Only)
Westvaco Chlor-Alkali Div. 87
*Wilfley & Sons, Inc., A. R. Outside Back Cover
Willys Motors, Inc. 10
Wilson, Clyde H. 104
Wilson, Glenn B. 106
Wisser & Cox 104
Wolf, Harry J. 104
Wood Assaying Co., Henry E. 104

SPORTSMEN-PROSPECTORS

Complete portable ultra-violet flash light for use of the uranium prospector—hunter—sportsman. Compact, sturdy; operates on flashlight batteries. Powerful beam causes fluorescent uranium mineral to glow at ten feet. Perfect for bead test. $3.50.

PROSPECTORS SPECIALS

NEW OPTICAL URANIUM DETECTOR GEIGERSCOPE	$3.00
URANIUM RADIOACTIVE ORE SPECIMEN KIT	2.50
URANIUM BEAD TEST KIT	2.50
LONG WAVE ULTRA VIOLET BULB	3.00
SHORT WAVE ULTRA VIOLET BULB	3.00

Send cash, check, M.O. and return address to: GORDON PILLING, DEPT. M.W. 8, 90 Broadway, Paterson, N.J.

GEOLOGIST with good background in mining and field exploration work desired by large Colorado uranium mining company—send complete employment record and references to Box B-2, Mining World, 121 Second Street, San Francisco, California.

FOR SALE: One Wemco #3 M Mobil Mill, Serial No. 5319750, a complete processing plant employing heavy mediaseparation process. Can be inspected at Guernsey, Wyoming. For further information contact Schroeder Mining Company, McGregor, Iowa, Paul E. Schroeder, President.

RESEARCH METALLURGIST: Required for Island of Cyprus. Metallurgical engineer or mining engineer with good training and experience in metallurgy to conduct tests for improving practice in 100 ton per hour mill floating heavy copper sulphide ores and also to conduct tests on grades and mixtures of varying copper content. Aptitude and interest primarily research. Age to 45 years. Three year contract. Salary open. Submit complete record and list of references with first reply. Cyprus Mines Corporation, 523 West Sixth Street, Los Angeles 14, California.

WANTED: Experienced diamond drill designer. Apply Chicago Pneumatic Tool Company, Utica, New York.

ENGINEER: Executive; age 39, graduate mining engineer, practical geologist, 21 years experience, exploration, development, operation, and construction in mineral production and beneficiation fields. Now employed, seeking new connection at management level with operating or development organization. Reply Box B-1, Mining World, 121 Second Street, San Francisco 5, California.

ASSAYER-ENGINEER for isolated field station of Territorial Department of Mines at Nome, Alaska. Must be qualified to do fire and chemical analyses for common ores and make field examinations of mineral prospects. Limited quarters provided at Nome station. Single status preferable due to travel. Position open April, 1957. Salary up to $7,000 per annum depending on qualifications. Contact Territorial Department of Mines, P.O. Box 1391, Juneau, Alaska.

RESEARCH METALLURGIST: Dr. of Chemistry, Argentina, 40, single, diversified experience in applied research; 6 years in ore dressing, presently same on low grade uranium ores. Would consider interesting offer to work in USA within similar field. First order Argentina and American references. Metallurgist, Lambare 880, 1°A, Buenos Aires, Argentina.

Applications are invited for position of Electrical-Mechanical Superintendent in South West Africa for large base metal mining and milling operation, including modern 14,000 KVA steam and diesel plant, 50,000 tons per month concentrator, AC and DC hoists, underground pumping plants, complete shops, oxygen plant and other machinery. Applicant should be a graduate electrical engineer and have considerable practical and supervisory experience in plant operation and maintenance. Ideal climate with excellent living conditions. Apply to Box A-4, Mining World, 121 Second Street, San Francisco 5, California stating age, marital status and experience.

METALLURGIST wanted by Northwest phosphate company to take over operation of beneficiation pilot plant and carry through this work to full-scale plant operation. Salary open. Reply Box Y-4, Mining World, 121 Second Street, San Francisco 5, California.

Longyear

Longyear.... complete service to the mining industry

From advance reconnaissance to mine development... look to Longyear for complete service

DIAMOND CORE DRILLS

Research and development have put Longyear diamond core drills, equipment and supplies in demand by mining men everywhere. The Longyear Wire Line Core Barrel shown on this page is one example of Longyear's forward-looking policies in the development of drilling equipment.

CONTRACT DRILLING

High core recovery at minimum cost is the standard successfully maintained by efficient Longyear drill crews on the job. Exploratory drilling, foundation testing, soil sampling, and grout hole drilling are some of the services available to you through the Longyear Contract Drilling Division.

GEOLOGICAL, MINING CONSULTING

Longyear's full staff of geologists and mining engineers can provide you with professional assistance in every phase of your operation—from advance reconnaissance to mine development.

FOR MORE INFORMATION ABOUT LONGYEAR AND LONGYEAR EQUIPMENT, WRITE FOR GENERAL BULLETIN #96.

Using the Longyear Wire Line Core Barrel, this drill crew is able to obtain excellent core samples *without* pulling the entire string of drill rods after each core run. This drilling tool is revolutionizing exploratory diamond core drilling.

This Longyear contract drill team knows how to get good core samples with a minimum of time on the job. Highly trained Longyear crews using modern equipment are available for short or long-term drilling assignments in any part of the world.

These Longyear geologists are conducting a magnetometer survey. Longyear maintains a full staff of geologists and mining engineers to provide assistance as you require.

Diamond Core Drill Manufacturers
Core Drilling Contractors • Mining Engineering and Geological Consultants

E. J. LONGYEAR CO. CABLE LONGCO
General Offices: Foshay Tower
Minneapolis 2, Minnesota

CANADIAN LONGYEAR LTD., NORTH BAY, ONTARIO • LONGYEAR ET CIE., PARIS, FRANCE

Why WILFLEY Sand Pumps Give You LOWER Pumping Costs:

1. Maintained High Efficiency
Wilfley's take-up adjustment allows maintained high efficiency throughout the life of the parts.

2. Low Maintenance Cost
The unique Wilfley design and rugged construction make little or no maintenance a reality.

3. Quick-Change Features
Absolute minimum downtime is required to change worn parts.

4. Interchangeable Metal or Rubber Parts
A selection of the right combination of rubber or hard alloy iron parts can be made to solve your pumping problems.

Wilfley Acid Pump
"COMPANIONS IN ECONOMICAL OPERATION"
Wilfley Sand Pump

Individual Engineering on Every Application

Write, wire or phone for complete details.

A. R. WILFLEY and SONS, Inc.
DENVER, COLORADO, U.S.A.
New York Office: 1775 Broadway, New York City